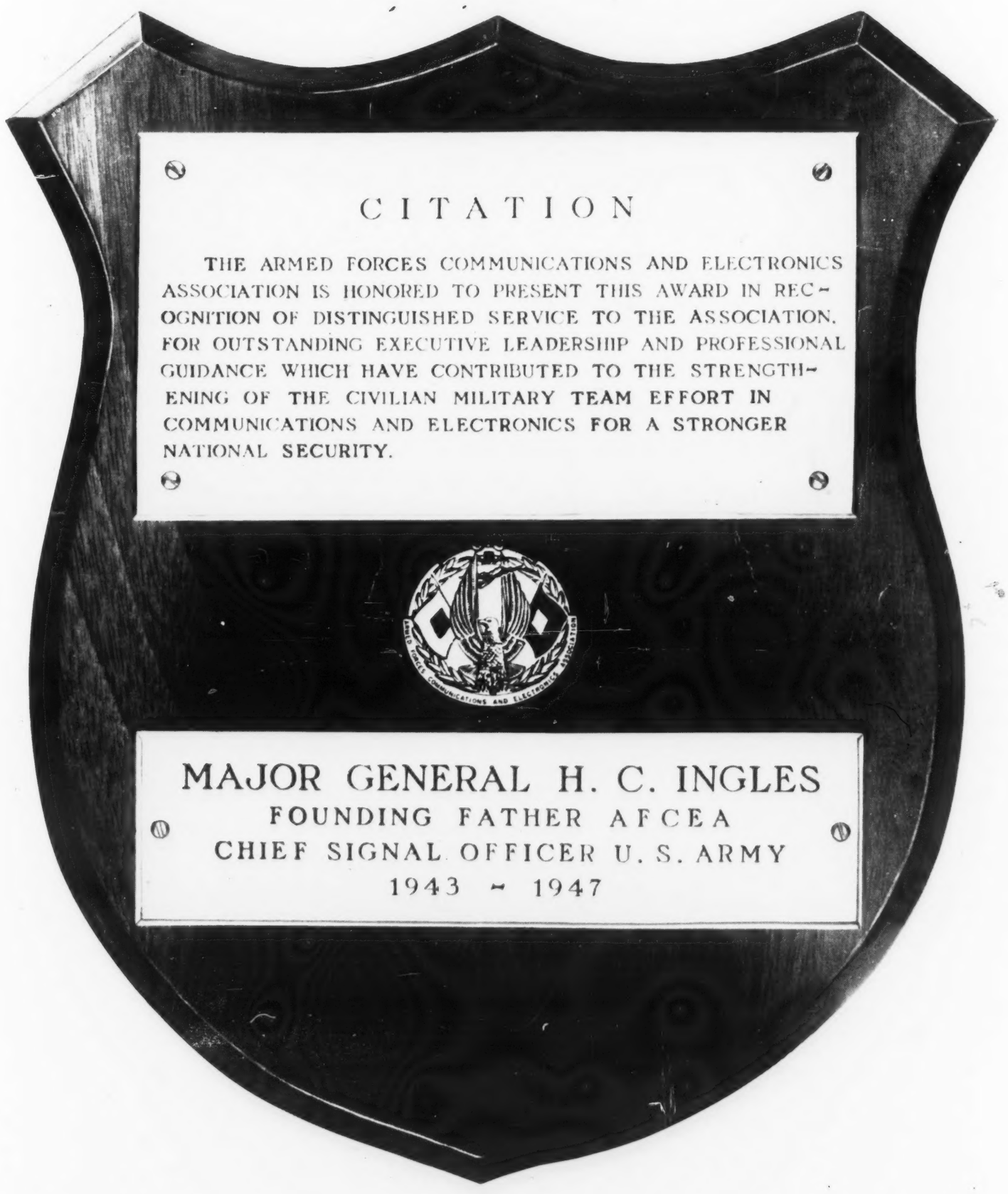
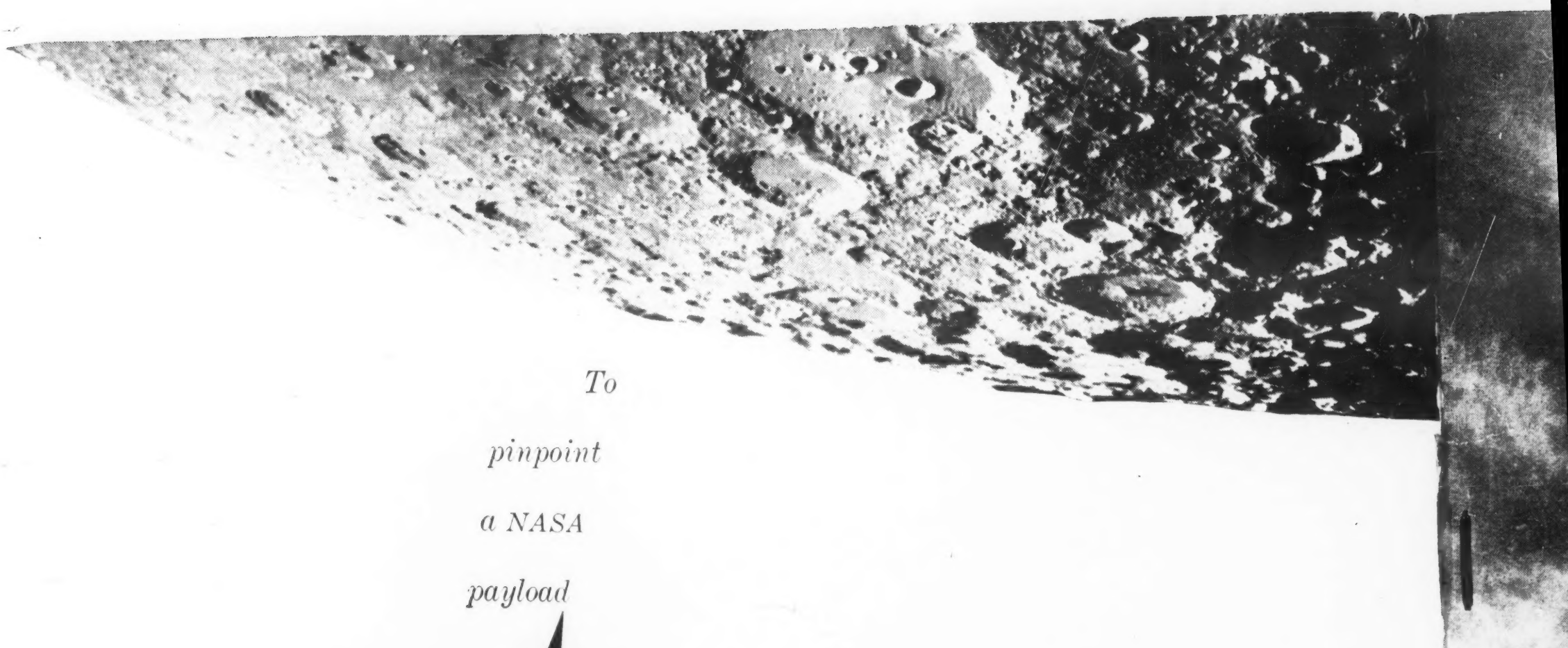
SIGNAL

15TH ANNUAL AFCEA CONVENTION REPORT—PART 11



September 1961



To

pinpoint

a NASA

payload

on

the

moon...

requires

Motorola

systems

reliability

CALTECH'S JPL RANGER,

to carry research instrument packages to the moon, will rely upon precision design, construction, testing and performance of Motorola electronic equipment. Comprehensive measurements of operational and navigational data aboard will be assembled for transmission by its Flight Data Encoder. An all solid state Transponder generates the telemetry carrier, receives ground commands, and translates carrier frequencies for two-way Doppler velocity measurements. ☆ In laboratories and at launch site, Payload Test Sets will check out the spacecraft RF communications system. At NASA's transmitter and receiver sites, Calibration Beacons will check command transmitter performance and radiate precise signals to test telemetry receivers. ☆ Motorola's participation in Ranger lunar probes demonstrates its space communications capabilities for frontier programs.

Military Electronics Division MOTOROLA

Qualified technical personnel are invited to apply

CHICAGO 51, Illinois, 1450 North Cicero Avenue
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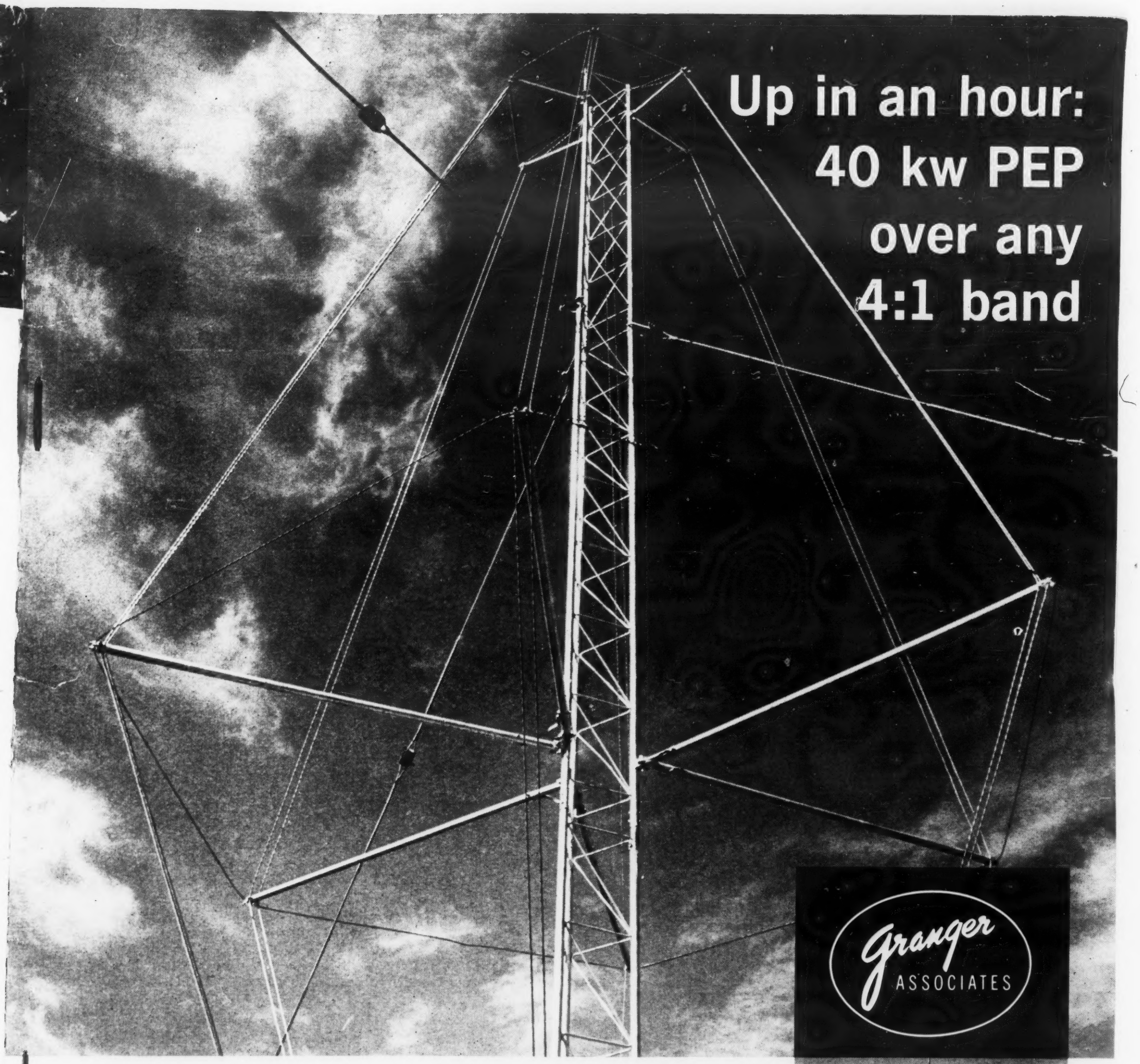
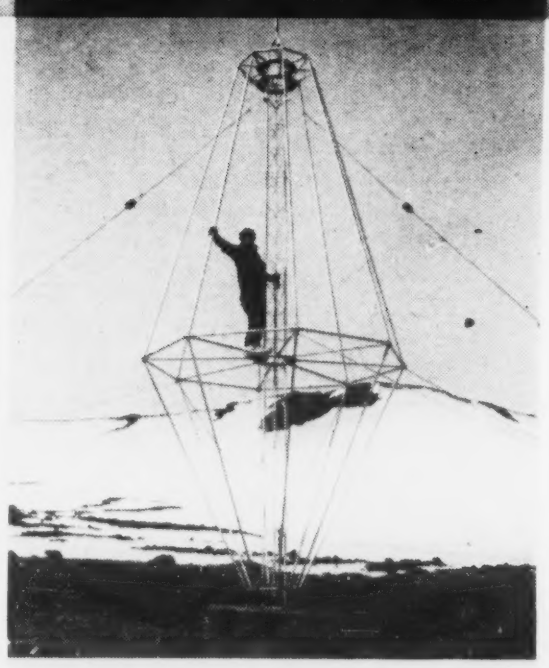


Granger ASSOCIATES



For h-f broadcast, this conical monopole antenna offers electrical performance and structural properties worth looking into. VSWR is 2.7:1 rel./50 ohms and 2.5:1 rel./75 ohms. The azimuth radiation pattern is essentially circular, and the elevation plane pattern is similar to that of a quarter-wave monopole. Even more important: the excellent performance of these wide-band vertically polarized monopoles can be available in the field in one hour's erection time—without the use of heavy construction equipment. Antennas now in service for USAF and U.S. Navy include models for corrosive atmosphere and for service in arctic environments. This is G/A series 753. Data sheet available from the nation's fastest growing producer of h-f antenna systems:

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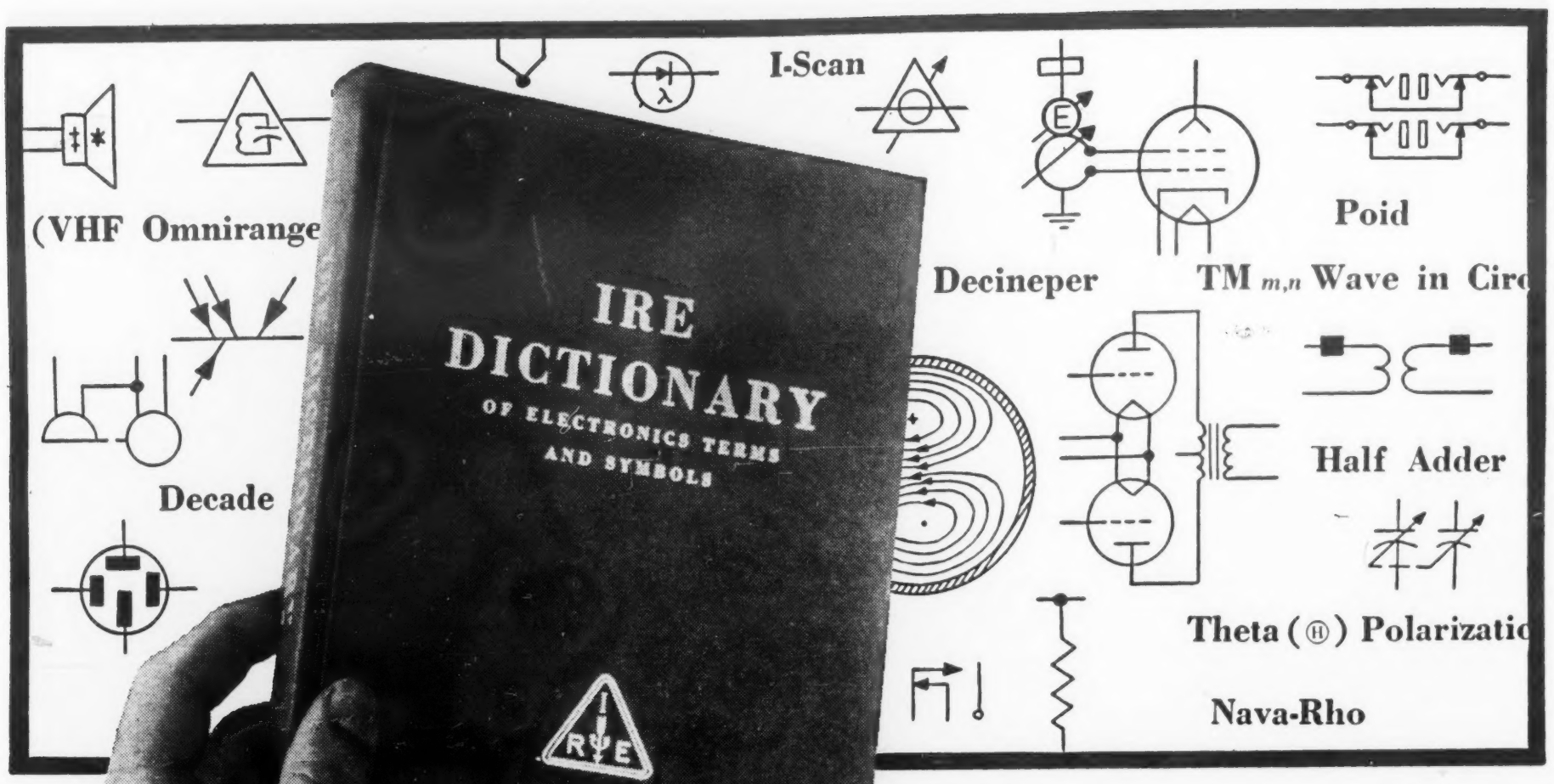

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PART II of this 225 page volume is a Dictionary of Symbols, made up of five IRE Standards: Letter Symbols for Electron Tubes; Letter Symbols for Semiconductor Devices; Graphical and Letter Symbols for Feedback Control Systems; Graphical Systems for Semiconductor Devices; and Graphical Symbols for Electrical Diagrams. A four-page index to graphical symbols is included.

THE INSTITUTE OF RADIO ENGINEERS
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SIGNAL is published monthly by the Armed Forces Communications and Electronics Association at 1624 Eye St., N. W., Washington 6, D. C. Second class postage paid at Washington, D. C., and at additional mailing offices.

Subscription rate to members of the AFCEA: 1 year (12 issues), $5.00. To non-members, $7.00. To foreign post offices, $8.00. Single copies, $1.00 each. Printed in U.S.A. by Monumental Printing Co. at Baltimore, Md. The publisher assumes no responsibility for return of unsolicited manuscripts or art. When sending change of address, please list the old and the new address, and allow 3 weeks for delivery of first copy.

BPA

SIGNAL

Communications-Electronics-Photography

Journal of the Armed Forces Communications and Electronics Association

VOLUME XVI SEPTEMBER 1961 NUMBER 1

CONTENTS

Cover

Pictured on the cover is one of the AFCEA Distinguished Service Awards first presented at the Annual Banquet during the 15th Annual AFCEA Convention. These plaques were awarded to Maj. Gen. Harry C. Ingles, USA (Ret.); Brig. Gen. David Sarnoff, USAR; Frederick R. Lack; Theodore S. Gary; William J. Halligan, Sr.; Brig. Gen. W. W. Watts, USAR; RAdm. Joseph R. Redman, USN (Ret.); Dr. George W. Bailey; Col. Percy G. Black, USA (Ret.); RAdm. Frederick R. Furth, USN (Ret.) and Benjamin H. Oliver, Jr.

DEPARTMENTS

Beneath a field like this...

is a complex communications center

In minutes, an enemy attack could level some of our sprawling cities.

Because of this, the Bell System is now supplementing its great reaches of buried cable with a network of underground communications stations.

Under the protection of a thick earth and concrete cover, and away from major target areas, several Bell System communications centers are already in operation. Many more are to come.

The walls for these installations are huge, reinforced concrete slabs. Ventilation systems filter air so fine that even radioactive fallout cannot enter. Food and water are stockpiled. Living quarters are provided for all operating personnel.

These buildings are costly. Tough to build.

Yet, the Bell System recognizes that communications are the lifelines of our defense systems. And so we took the lead in establishing these underground centers with our own money.

There are many other ingenious projects in our "Survivability" program for America's communications. Many cannot be mentioned here.

Because of them, ambitious command, control and defense systems are feasible. And our vast existing network is available for further *tailor-made* defense communications.

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Other types of Hunter systems are widely used in winterization operations, for engine pre-heating, for emergency heating requirements and for many other using arm operations. Hunter heating systems are designed for cold starts down to 65° below zero and are air-circulating in type with thermostatic controls. Uncontaminated heat capacities range from 15,000 to 300,000 BTU/hour.

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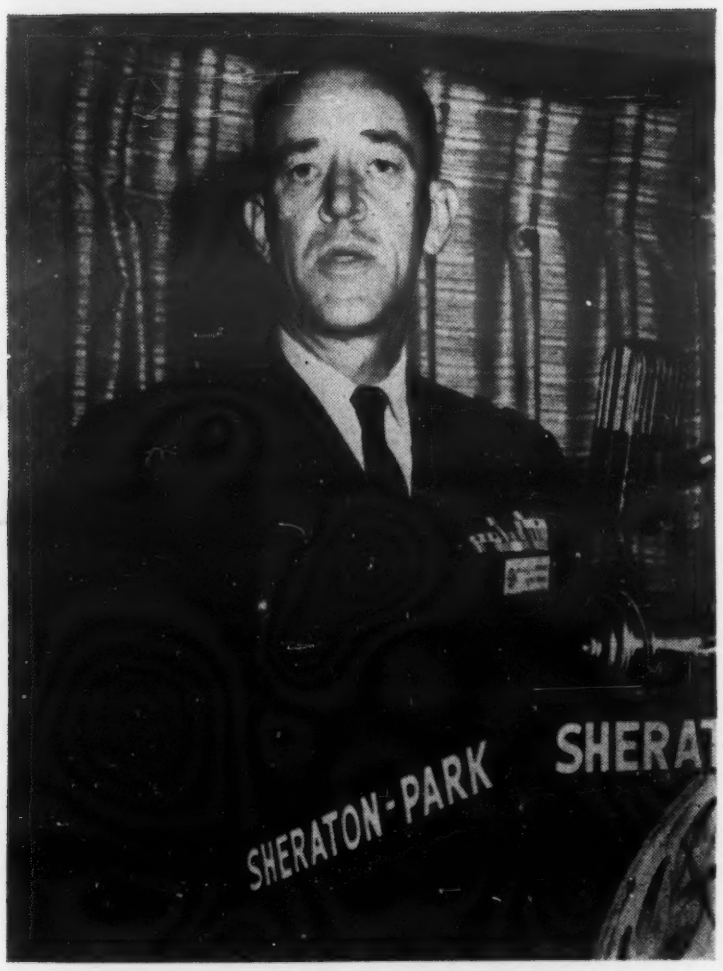

INDUSTRIAL LUNCHEON ADDRESS

by

MAJOR GENERAL KENNETH P. BERGQUIST, USAF
Commander, Electronic Systems Division
Air Force Systems Command

I FEEL INDEED PRIVILEGED to speak to this group, representing, as you do, leaders in the fields of electronics, communications and photography. Your organization performs a most vital service by serving as a connecting link between industry, and the military, in our important and cooperative work. I want you to know that we appreciate your efforts.

I will discuss with you today Command and Control in the Aerospace Age, and tell you a little about the Electronic Systems Division and the projects it manages.

Recall, if you will, some of the remarkable breakthroughs that have occurred in the New Horizon of space during this century, and that have sent "Time and Distance in Full Retreat." I need not recite them to this knowledgeable audience. Science has virtually annihiliated the barriers of time and space as we have known them in the past.

The advent of new weapons, new techniques and new means of delivery has radically changed the requirements for national defense. The compression of time and space and the quantum jump in nuclear explosive developments have meant that the commander must have new techniques and new means in order to command and control his weapons and forces.

The new facts of military operation that we must face in the Space Age and upon which we must base the development of our Command and Control systems are these:

1. The entire world and the aerospace surrounding it are now the potential theater of war.

2. The ability of a nation to apply nuclear power halfway around the world in a matter of minutes has made irrevocable the decision to respond in minutes to enemy attack.

3. The impact of such decisions and the compression of time and space dictate centralized control—positive, accurate, safe and sure control of weapons and forces.

4. The great quantity and abstract quality of data that must be considered have imposed a tremendous load upon our operational commanders and our responsible civilian chiefs.

5. The extreme gamut of situations—the traditional military support of peaceful exploration, world-wide military assistance in disasters, cold war actions, limited war capability requirements, and instant readiness for general war—all these together necessitate the utmost in flexibility and adaptability.

The techniques of Command and Control and the systems they use had to be constantly improved and modernized to keep pace with the speed of weapons delivery and their explosive power. Unless we keep up with technological advancements and constantly improve our Command and Control systems, the machines of war could outstrip the control ability of their creators.

This places a great premium on the development and improvement of Command and Control systems and their techniques for detecting the approach of invading enemy forces, determining counter-measures to be taken and controlling precisely these counter-actions. Such systems are also essential to provide efficient management of resources—in peace or war—and to be capable of immediate reaction to any of the gamut of situations stated previously.

Electronic Command and Control systems are the tools by which the Commander controls his weapons and forces. The systems themselves are not brains. They are only the servants of the man, and they depend on him to supply them with their initial information. These electronic systems are only as intelligent as the men who create and operate them.

Command and Control systems merely help the Commander organize information in readily usable form to help him make his estimate of the situation and relay his decisions to the person or machine he commands. They help him to plan better; they help him to make quicker, more knowledgeable decisions. The Commander must dictate the use of his electronic aids at all times, and they must be flexible and responsive to his direction

in order for him to employ them effectively.

In the Electronic Systems Division we manage the design and implementation of what we have been calling "L" systems which are electronic data processors and networks of sensors and communications. Our mission is to produce a total ground environment capable of servicing all aerospace weapons and forces.

Today's electronic digital computers, transistorized for minimum size and maximum speed, can store, recall and analyze astronomical quantities of data and respond to keyboard instructions in a flash.

A summary of what I have just said provides us with a technical definition of Command and Control systems —the data collection, transmission, processing and display presented to the Commander to facilitate timely and proper decisions, and the execution thereof.

Purposes of Command and Control Systems

To what purpose then does the Commander employ his Command and Control systems? They are used to aid in performing the following functions:

1. To insure that the weapon force is trained, exercised and held in a constant high state of combat readiness.
2. To alert and warn the Commander of hostile actions or threatening activities by an enemy.
3. To gather, correlate and process situation data to help in making decisions.
4. To control the weapon force.
5. To provide instantaneous communication for globally dispersed forces.

These electronic systems are also used for the management of resources in peacetime. In short, Command and Control systems can be employed to promote rapid and efficient reaction to any situation, in peace or war.

There is sometimes a confusion concerning the differences and relationships between the weapon systems and the Command and Control systems. Stated simply, weapon systems are extensions of the Commander's *physical* power to fight; Command and Control systems are extensions of his *mental* ability to command.

Or, let's look at it this way—a weapon system may be compared to the electrical devices in a house, such as a coffee pot, a kitchen range, or an electric iron in that these appliances become obsolete with time and new developments. A Command and Control system may be compared to the wiring system itself. It doesn't often become obsolete. We add to it, modernize or revise it to fit the current need. Or, better still, we try to anticipate future needs by incorporating expansion capacity or anticipated changes in the wiring system when it is built. With Command and Control systems, we try to build for future needs; and we add to and modernize existing systems to make changes in consonance with new requirements.

Weapons systems are *revolutionary*, whereas Command and Control systems are *evolutionary*.

Systems Must be Compatible

But the weapon system, and the Command and Control system, must be compatible. They must be carefully integrated into an operational total system. The effectiveness of our weapon systems depends upon the effectiveness of their Command and Control. There must be an over-all integration of the vehicle with the ground electronic complex to form the complete functional System. And there must also be an integration between the various electronic systems to provide a total ground environment for effective direction of our aerospace activities.

Command and Control systems can be divided into the following categories: Command, Control, Sensor and Support. There are certain characteristics unique to each category.

Command Systems are imbedded in people and organizations. They must grow with the organization and provide for ever increasing efficiency in functions performed by a Commander and his staff. These systems are sensitive to changes in organization. They are less sensitive to the state-of-the-art from the point of view that, if they use computers, for example, it isn't necessary to have the latest models. Typical command systems are equipped with displays, internal group communication devices, evaluation mechanisms and external communication devices. The NORAD Combat Operations Center at Colorado Springs is a typical command system.

Control Systems are imbedded with the threat and weapons. If the enemy should build a new kind of weapon, our control system would have to be sensitive to the new threat. These control systems are composed of radars, digital devices, communication lines, computers, displays, radio transmitters and other equipment. The Semi-Automatic Ground Environment system, known as SAGE, would be an example of one of our control systems.

Sensor Systems are imbedded in the environment. For instance, if our battle area were on the back side of the moon, our sensor problem would be entirely different from what we are engineering today. These systems are sensitive to the state-of-the-art. Our Ballistic Missile Early Warning System—BMEWS—is a sensor system. Another is SPADETS—Space Detection and Tracking System.

Finally, the *support* systems are the networks which tie together, or provide service to, these command, control and sensor systems. These support system networks are common to all the other systems; they support the Command and Control team. The Air Force global Communications System, the Intelligence Data Handling Systems and the Weather Observation and Forecasting System are examples of support systems.

Reorganization

The development and production of these electronic Command and Control systems was formerly the responsibility of the Command and Control Development Division (C^2D^2) of Air Research and Development Command (ARDC) and the Electronic Systems Center (ESC) of Air Materiel Command (AMC), both located at Hanscom.

As of 1 April, as you probably know, a reorganization took place in the Air Force. At our level, C^2D^2 and ESC were made a new division—the Electronic Systems Division.

ARDC and parts of AMC were combined to form a new Command—Air Force Systems Command (AFSC), commanded by General Schriever. The remainder of AMC was made the Air Force Logistics Command. AFSC has the mission of providing all aerospace system programs from research, development and test through production, installation, check-out and delivery to the using command.

AFSC has divided its major system responsibilities into four divisions:

- The Ballistic Systems Division at Inglewood, California.
- The Space Systems Division, also at Inglewood
- The Aeronautical Systems Division at Wright-Patterson Air Force Base in Dayton, Ohio
- And our Electronic Systems Division with its head-

(*Continued on page* 10)

URGENT:

STOP THAT MISSILE—
AND THE NEXT ONE TOO!

In probing uncharted areas of electronics to solve the critical anti-missile problem, our scientists and engineers have developed advanced early warning systems of vital significance to national security.

For example, our work on ballistic missile defense systems has led to the development of a unique method for performing a great many dissimilar radar functions simultaneously and from one antenna. This technique —known as multifunction phased array radar—allows one advanced radar to replace many conventional radars. It permits long-range detection and selective tracking and targeting of numbers of small high-speed objects, including satellites, other space vehicles, missiles and warheads.

Since tracking beams can be positioned in a *fraction of a microsecond,* it is possible to track a great many targets while continuously searching for additional missile threats. And because phased array radar beams are electronically steered, the antennas do not rotate; and there is no chance for mechanical failure.

Major advances such as phased array radar are typical of the work being done by the scientists and engineers of the entire General Telephone & Electronics corporate family. The vast communications and electronics capabilities of GT&E, directed through Sylvania Electronic Systems, can research, design, produce, install and service complete systems. These include the entire range from detection and tracking, electronic warfare, intelligence and reconnaissance through communications, data processing and display.

That is why we say—the many worlds of defense electronics meet at Sylvania Electronic Systems, division of Sylvania Electric Products Inc., 40 Sylvan Road, Waltham 54, Massachusetts.

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quarters at Hanscom Field near Boston.

Our Electronic Systems Division has the management responsibility for all design and implementing phases of all our ground electronic systems, thus providing for continuity of management in our projects from concept to check-out. This includes advanced conceptual planning, applied research and development, design, procurement, production, installation, test and evaluation.

A major supporting agency, and sub-organization of the Electronic Systems Division is the Rome Air Development Center (RADC) at Griffiss Air Force Base near Rome, N.Y. This Center constitutes a highly skilled in-house capability for conducting—and managing by contract—applied research, component development and sub-system creation. RADC will play an increasingly important role in research and development activities and in our very intense effort to achieve standardization of Command and Control system building blocks. A greater degree of such standardization is required to insure appropriate integration of systems and to promote economy.

Directly assisting our Division at Hanscom is the "not-for-profit" MITRE Corporation which provides analytical planning, technical guidance and supervision, and inter-system engineering. Also participating in our daily endeavors are representatives of the using commands (such as SAC, NORAD and ADC) logisticians, and liaison personnel from the Air Training Command. Next month we will welcome a very important addition—a detachment from the Air Force's newest command, the AFCS. (AFCS activated July 1, 1961)

Together, at Hanscom, we are planning and evolving what I call the Aerospace Control Environment. With an operator-technician-logistician team we are applying the concept of concurrency in managing, from the view point of an integrated whole, the acquisition of Command and Control systems.

Backing us up, and also located at Hanscom Field, are two well known establishments: The Cambridge Research Laboratories of the Air Force Office of Aerospace Research, and MIT's famous Lincoln Laboratory. We work very closely with these institutions, receiving direct and indirect support from their basic research activities, and in many instances, participating jointly with them in special studies and in certain applied research projects.

What I have been trying to convey is that, in recognition of the Command and Control system endeavor which is now emerging as a vital role in national security, the Air Force initiated action which resulted in the Department of Defense now having establishments in the Hanscom Complex capable of continuing, and expanding as necessary, the effort required in this area which is so essential to our national defense. We have organized, deliberately chosen an advantageous location, assembled resources, concentrated management responsibility, developed concepts and are well underway in our important task.

There has also been a streamlining of procedures to assist us in our mission. High priority systems now have what we call "a red line route to the top" for major decisions.

At present there are 14 command and control systems approved for implementation and under ESD management. I have already mentioned seven—the NORAD Control Center, SAGE, BMEWS, SPADETS, Global Communications, Weather Observation and Forecasting Systems and the Intelligence Data Handling Systems.

I would like to interject here that our Air Force Global Communications System program has seen considerable growth in its importance and magnitude. This global communication system will assure inter and intra system communication service to support world-wide Air Force operations. The Air Force Data Transmission System will be added to this project, as well as continued work on tropospheric scatter systems and switching and terminal devices. We are looking forward to making significant improvements in *survivable* communications in this system and to having it make a major contribution to the Defense Communications System of the DOD.

Another system is concerned with the extension of the Distant Early Warning, or DEW line. This eastern extension of the DEW line across Greenland will be completed during the next fiscal year.

We also manage the up-dating of the Strategic Air Command and Control System, involving a rather highly sophisticated network, communications switching and data display. This is, of course, one of our highest priority projects.

Other systems currently under development or production under the direction of ESD include: An overseas theater tactical Air Weapons Control and Warning System; An Air Traffic Control and Landing System for special Air Force needs; A Data-Processing and Display System for USAF Headquarters.

I would like to close my discussion with a summary and emphasis of my main points.

Need For Constant Improvement

I have discussed Command and Control as a newly specialized and necessary requirement of the aerospace age when new horizons have sent time and distance into full retreat. I am sure you are aware of the serious consequences if our Command and Control systems are not constantly improved to keep up with the technological advances in weapons and their delivery. The electronic systems we have today are absolutely essential to the defense of the Free World because our weapons and our forces are helpless without the means to command and control them.

We are applying the principles of reliability, flexibility, adaptability, integration, concurrency, and readiness for any situation in peace or war. We are striving to provide systems which, as General LeMay expressed it, "must be safe, secure, simple and sure."

The importance of our Command and Control mission and the systems we have to help us perform this mission has been underscored by highly placed authorities.

President Kennedy in his special budget message to Congress said: "The basic policies stated at the beginning of this message lay new emphasis on improved Command and Control—more flexible, more selective, more deliberate, better protected and under ultimate civilian authority at all times. This requires not only the development and installation of new equipment and facilities; but, even more importantly, increased attention to all organizational and procedural arrangements for the President and others. The invulnerable and continuous command posts and communications centers provided in these recommendations are only the beginning of a major, but absolutely vital, effort to achieve a truly unified, nation-wide, indestructible system to assure high-level command, communication and control and a properly authorized response under any conditions."

This statement by the President clearly sets forth the goal of our efforts. Command and Control systems will become increasingly important in the challenging days ahead when man probes deeper into the mysteries of space and pushes further back the barriers of time and distance. We need the full understanding and support of industry, and organizations like AFCEA, to prevail.

PRODUCTS OF THE PIONEER IN MILITARY ELECTRONICS...

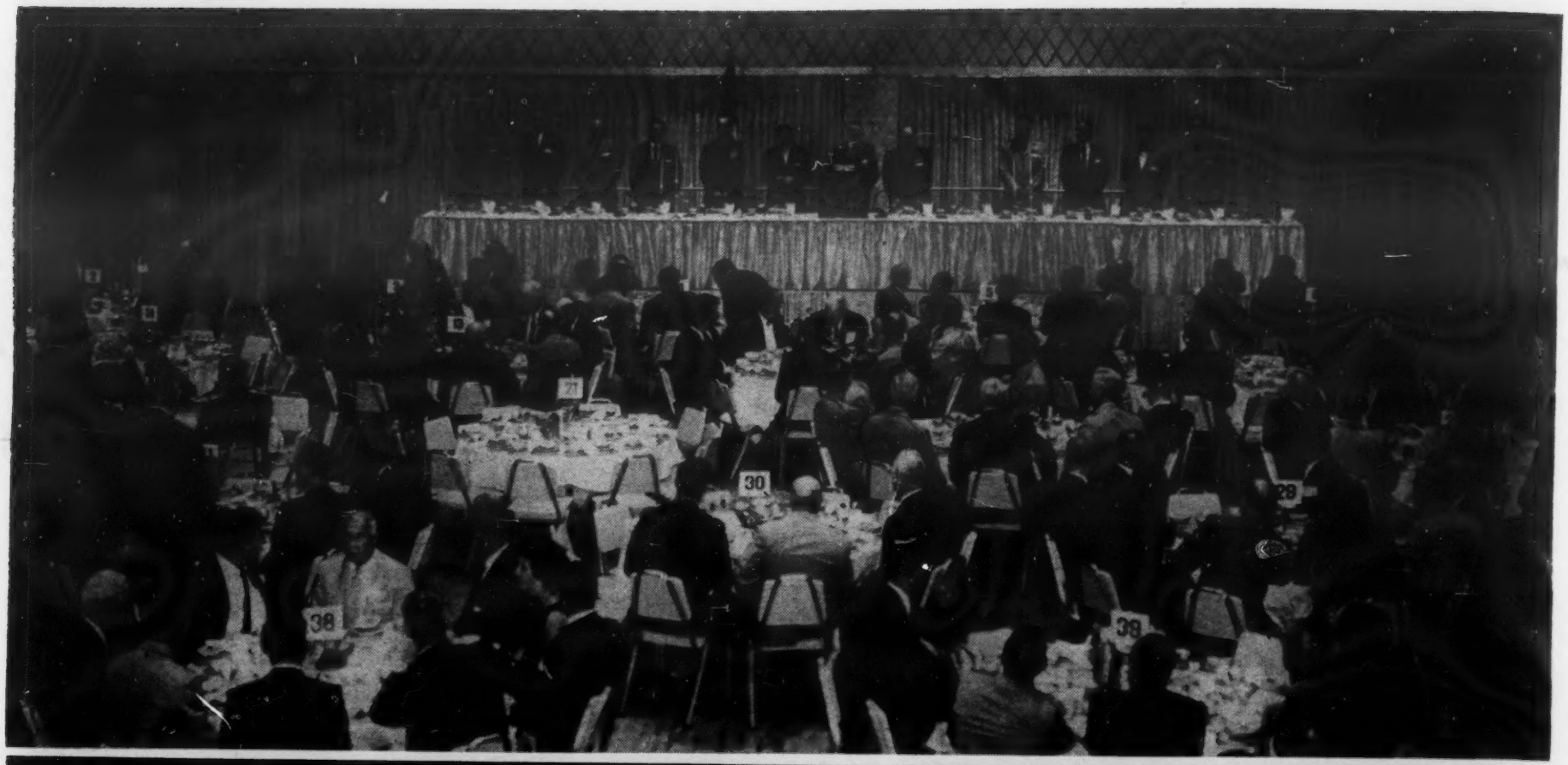
As a department of Fairchild's Defense Products Division, Du Mont Military Electronics provides acknowledged leadership in data acquisition, transmission and display, and support systems. These Du Mont talents have developed high resolution electronic imaging systems operating in the visual and near infrared portion of the spectrum, and from daylight illumination levels to overcast moonless nights. Electro-visual fire control, radar boresighting, missile guidance and space reconnaissance are typical applications. Millimeter wave radar for navigation, detection, tracking and ranging of surface and air targets is a specialized area of outstanding achievement. Rapid go-no-go electronic test equipment also has been designed and produced for operational check-out of missile, drone and aircraft systems.

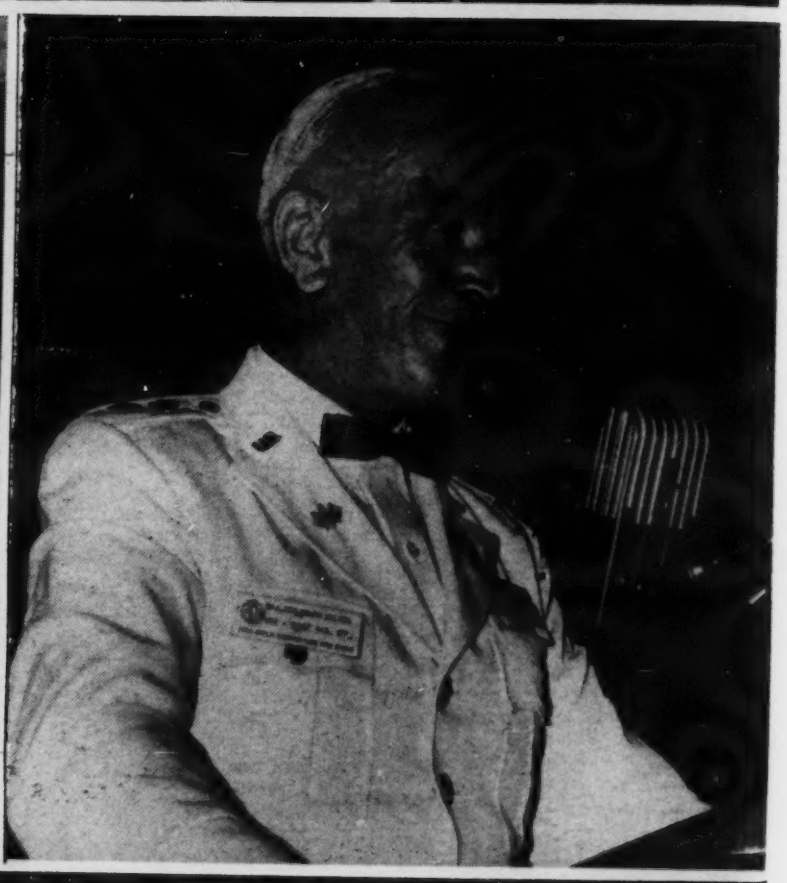
Whatever the environment or the requirement—the Du Mont Department offers over 25 years of experience as the pioneer in military electronics. *For information or specifications, write the Marketing Manager, Du Mont Military Electronics Department, Defense Products Division, 750 Bloomfield Avenue, Clifton, New Jersey.*

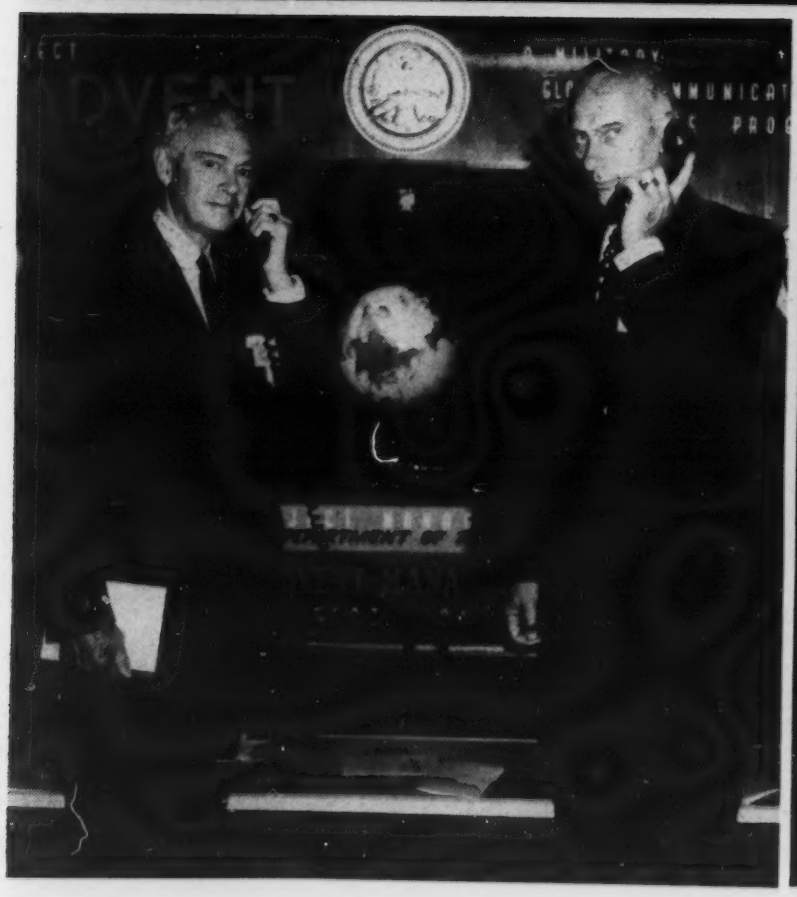
FAIRCHILD
CAMERA AND INSTRUMENT CORPORATION

DEFENSE PRODUCTS DIVISION

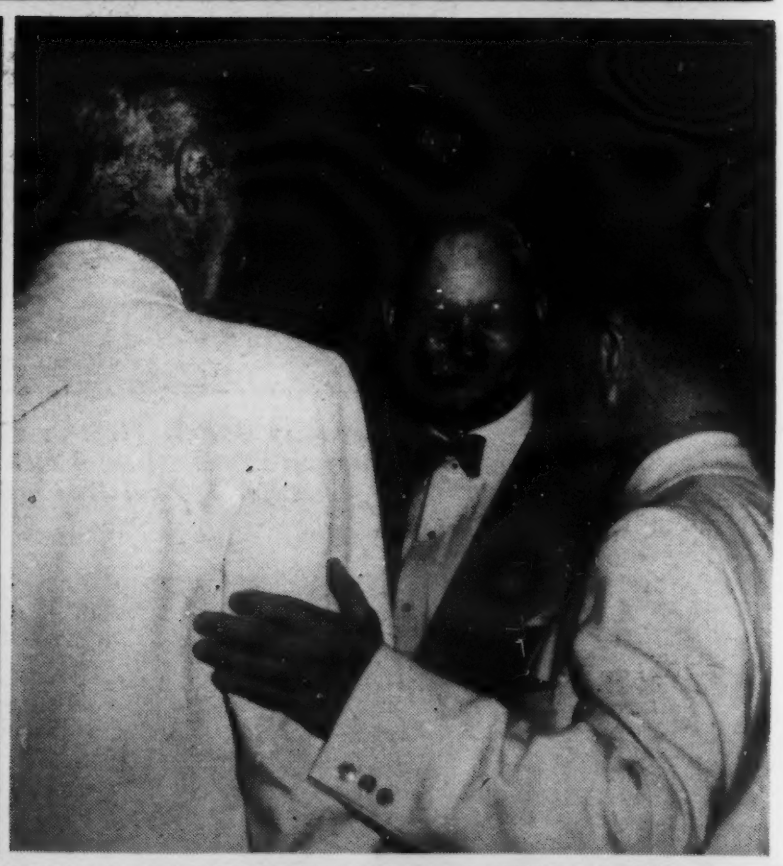
Engineers and Scientists are invited to discuss new opportunities presented by continuing growth of the Defense Products Division.







Convention Activities



Convention Activities

PANEL DISCUSSIONS

The role of electronics is an ever broadening sphere reaching out into many fields. The relationship of electronics to photography and law was examined at two panel discussions during the 15th Annual Convention. Such matters as the application of photographic instrumentation and the electronic rectification of oblique aerial photography were discussed at the "Scientific Applications of Electronics in Photography" panel. The use of incentive contracts and an explanation of the Armed Services Procurement Regulations were among other subjects which were explored at the Federal Bar Association panel on "Recent Developments in Government Contracts and Procurement Procedures Stressing Electronics." These panels are presented in the following pages. Last month in Part I of the Convention proceedings, SIGNAL published the two communications and electronics panel presentations. These panels were entitled "Present Media and Future Concepts of World-Wide Communications" presented by International Telephone and Telegraph Corporation, and "New Frontiers in Reliable Communications" presented by General Telephone and Electronics Corporation.

Photography Panel: (left to right) Robert H. Morris, Dr. Howard M. Tremaine, Dr. Samuel W. Levine, Keith B. Lewis, RAdm. Robert S. Quackenbush, USN (Ret.), Paul H. Cords, Ernest L. White and Donn L. Ockert.

Federal Bar Association Panel: (left to right) John G. Gregg, Joel P. Shedd, E. K. Gubin, Gerritt Wesselink and George W. Markey, Jr.

PANEL ON

SCIENTIFIC APPLICATIONS OF ELECTRONICS IN PHOTOGRAPHY

MODERATOR—RADM. ROBERT S. QUACKENBUSH, USN (RET.), ENGINEERING DIVISION, POLAROID CORPORATION—INTRODUCED BY KEITH B. LEWIS, MANAGER, WASHINGTON OFFICE, EASTMAN KODAK COMPANY

ELECTRONICS AS A TOOL IN PHOTOGRAPHIC INSTRUMENTATION

SPEAKERS: PAUL H. CORDS, SUPERVISORY-TECHNOLOGIST, PHOTOGRAPHIC EQUIPMENT AND ERNEST L. WHITE, SUPERVISORY DEVELOPMENTAL ELECTRONIC TECHNICIAN, NAVAL ORDNANCE LABORATORY

WE USE ELECTRONICS as a tool in photographic instrumentation. Although the title is perhaps somewhat controversial, it was chosen deliberately to stress the importance of the photographic role in data gathering in modern research.

I would like to describe the mission of the Naval Ordnance Laboratory. NOL conducts research, design, development tests and technical evaluations of complete ordnance systems, assemblies, components and materials pertaining to existing advanced and proposed weapons. This is principally in the fields of missiles and underwater ordnance.

Now the photographic role in all this is the development of engineering processes, test apparatus and techniques involving electronics, optical and photographic instrumentation.

Both authors are detailed in the air ballistic area of NOL. It is in this area that the flight feasibility of various missile shapes are tested in the wind tunnels, shock tubes or shock wind tunnel and the ballistic ranges. This ultimately leads to the necessity of a good understanding and communication and, above all, teamwork between the electronic and photographic personnel. I think we have it.

All too often a single person is detailed to complete instrumentation in both the electronic and photographic instrumentation. I think this invariably is a perilous path at best, and the quality of one field will eventually be sacrificed for the other. Each type of personnel has its own specialized training and knowledge area. It is not enough to know the physical characteristics of the camera or the electronic system of the camera. Since the photographic film is used as a recording medium its characteristics must be known. One must know the type of film that is best for a project, the type of contrast you want to use, the best developer for this thing, and the relative sensitivity of the film as to wavelength, and so forth.

Teamwork Key Word

The one prevalent thing, I think, that comes in there well is in the project engineer's asking for services. Invariably he will contact both the photographic and the electronic groups and he will state the type of information he wishes to record. The photographic personnel in turn decides what type of camera, optical system and relevant equipment he needs; the electronic personnel helps design and fabricate these. In this way photographic instrumentation can be tied in to any independent electronic instrumentation. But again, teamwork is the key word.

Perhaps some examples of instrumentation in the existing facilities will show you how photography comes into its own. Let us consider a pressurized ballistics range. Within the range, a 300-foot enclosed tube and the pressure inside the tube can be regulated to either above or below atmospheric. Scale models of missile shapes are sent down the tube in velocities around 10,000 ft. per second. Certainly electronics plays an important part in the range, but has its practical limitations. Velocities can be estimated electronically by having a series of light screens throughout the tube. The light screen, of course, is made up of an incandescent lamp illuminating a photo-tube from across the flight path, and as the model passes between the photo-tube and the incandescent lamp, the voltage change is produced which, when amplified, can be used to register on a chronograph, and you can get your velocity.

But this is not enough information. You need much more. Thus at 25 points along the range tube, we have set up shadowgraph stations. The shadowgraph techniques make use of a diverging light coming from a point source, and it casts a shadow of the

PANEL DISCUSSIONS

The role of electronics is an ever broadening sphere reaching out into many fields. The relationship of electronics to photography and law was examined at two panel discussions during the 15th Annual Convention. Such matters as the application of photographic instrumentation and the electronic rectification of oblique aerial photography were discussed at the "Scientific Applications of Electronics in Photography" panel. The use of incentive contracts and an explanation of the Armed Services Procurement Regulations were among other subjects which were explored at the Federal Bar Association panel on "Recent Developments in Government Contracts and Procurement Procedures Stressing Electronics." These panels are presented in the following pages. Last month in Part I of the Convention proceedings, SIGNAL published the two communications and electronics panel presentations. These panels were entitled "Present Media and Future Concepts of World-Wide Communications" presented by International Telephone and Telegraph Corporation, and "New Frontiers in Reliable Communications" presented by General Telephone and Electronics Corporation.

Photography Panel: (left to right) Robert H. Morris, Dr. Howard M. Tremaine, Dr. Samuel W. Levine, Keith B. Lewis, RAdm. Robert S. Quackenbush, USN (Ret.), Paul H. Cords, Ernest L. White and Donn L. Ockert.

Federal Bar Association Panel: (left to right) John G. Gregg, Joel P. Shedd, E. K. Gubin, Gerritt Wesselink and George W. Markey, Jr.

PANEL ON

SCIENTIFIC APPLICATIONS OF ELECTRONICS IN PHOTOGRAPHY

MODERATOR—RADM. ROBERT S. QUACKENBUSH, USN (RET.), ENGINEERING DIVISION, POLAROID CORPORATION—INTRODUCED BY KEITH B. LEWIS, MANAGER, WASHINGTON OFFICE, EASTMAN KODAK COMPANY

ELECTRONICS AS A TOOL IN PHOTOGRAPHIC INSTRUMENTATION

SPEAKERS: PAUL H. CORDS, SUPERVISORY-TECHNOLOGIST, PHOTOGRAPHIC EQUIPMENT AND ERNEST L. WHITE, SUPERVISORY DEVELOPMENTAL ELECTRONIC TECHNICIAN, NAVAL ORDNANCE LABORATORY

WE USE ELECTRONICS as a tool in photographic instrumentation. Although the title is perhaps somewhat controversial, it was chosen deliberately to stress the importance of the photographic role in data gathering in modern research.

I would like to describe the mission of the Naval Ordnance Laboratory. NOL conducts research, design, development tests and technical evaluations of complete ordnance systems, assemblies, components and materials pertaining to existing advanced and proposed weapons. This is principally in the fields of missiles and underwater ordnance.

Now the photographic role in all this is the development of engineering processes, test apparatus and techniques involving electronics, optical and photographic instrumentation.

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missile and its accompanying air disturbance on a photographic plate.

Again, electronics plays an important part. Electronics couldn't do it alone; photography couldn't do it alone. Especially the small size. Perhaps if these models were a little larger, you might be able to put electronic components in them, but usually these models are comparatively small, and you would have difficulty putting in some transducers.

Hyper-Ballistics Range

One of the newest facilities is the 1,000 foot hyper-ballistics range. Like the 300 foot range, it is internally controlled as to atmospheric pressure. But it is built on a much larger scale. It is 1,000 feet in length and about 10 feet in diameter. Due to the large scale, it had to have a completely new type of shadowgraph system.

This system utilizes a 4 foot spherical reflector, an aluminum reflector with a polished silk and oxide surface. The spark located at the center curvature of the mirror flashes the shadow of the missile and its accompanying air disturbances on the reflector. The reflector in turn focuses light back down onto the camera system, the F25-7 inch air lens. And that lens in turn is focused on the reflector so as to produce a sharp image of the shadowgraph.

The light source for this is a barium-titanate type capacitor spark, which has a much shorter duration, about a quarter of a microsecond.

The relatively high efficiency of this type of system was chosen in order to make use of the relatively low light output of that spark. You have to have about a quarter of a microsecond, since even three-quarters of a microsecond will give you blur at the velocities that we are working with, that is, the hypervelocity region, 8,000, 10,000, on up, feet per second.

The methods for triggering the sparks for this shadowgraph system are quite unique. The light source on top of the camera has a slit and a red screen. We used an orthochromatic film, non-sensitive to red light. The slit on the light screen casts a sheet or ribbon of light over to the reflector. It is utilizing the reflector once more. The reflector again images the light back on a photo pickup unit, and again as the model traverses the voltage changes and you spark off your chronograph and your sparks.

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Installed at six points along the same range tube are several Schlerin stations. The Schlerin technique is essentially a parallel beam of light which is brought to a point at a knife edge. If there is no disturbance in the parallel beam of light, of course, the knife edge is adjusted so that about half of your light passes over it and onto a camera system and finally a screen or a ground glass or a piece of film. If there is a disturbance in the parallel beam, of course, there is refraction encountered, and some of your rays instead of passing over the knife edge, strike the knife edge, and as a result there is a decrease in intensity at that particular point.

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In addition to shadowgraph and Schlerin photograph, high speed photography is utilized to study frequency of vibration, oscillation or rotation of parts of the missile shape. Sequence photography is also used to record very many pieces of information on a single frame of film at short intervals. Time, pressure, date, test number, temperature, etc., can all be recorded on one single sheet of film. It can also be done electronically, I must admit. But think of the instrumentation that will have to replace that single sheet of film.

APPLICATIONS OF PHOTOGRAPHIC INSTRUMENTATION

SPEAKER: ROBERT H. MORRIS, PHOTO INSTRUMENTATION ENGINEER, ARMY PICTORIAL CENTER

BROADLY SPEAKING, photographic instrumentation is a collection of technical data by photographic methods. These can include x-ray photography of metal castings where the exposure lasts for hours, or a whole series of pictures during the ignition of an atomic bomb, where a single frame lasts a fraction of a microsecond and the whole series lasts less than a millisecond. Sometimes you don't even have to use visible light, you don't [illegible] use lenses, you don't ev[illegible] use silver-sensitized film[illegible]

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No one man can know everything about all the various things he needs to know. But he should know enough to talk with people and be able to translate their problems into photography.

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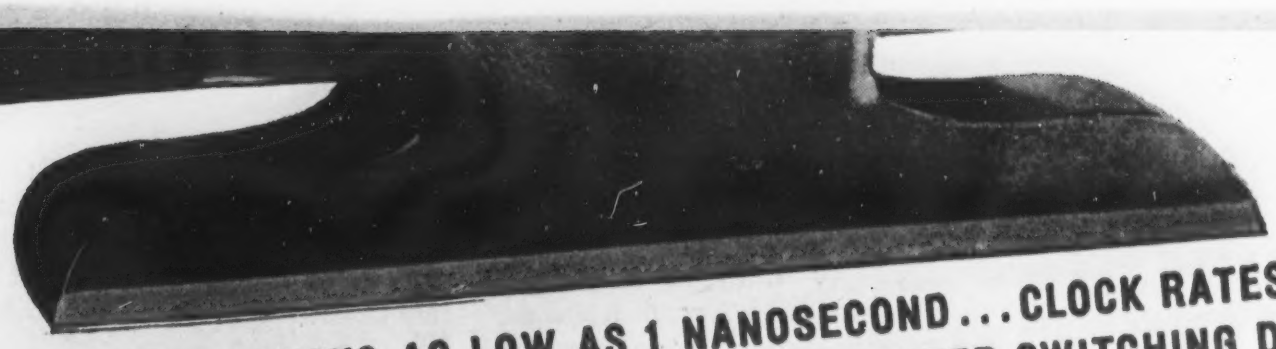
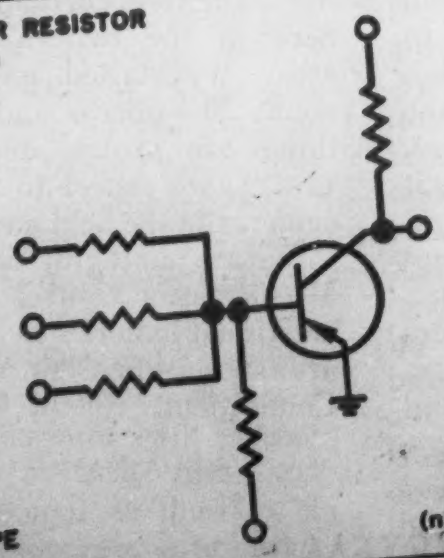
I would like to describe the work being done at the Army Pictorial Center. A year and a half ago, the Center set up a photographic instrumentation office. I am that office, more or less, at the moment. The

(*Continued on page* 18)



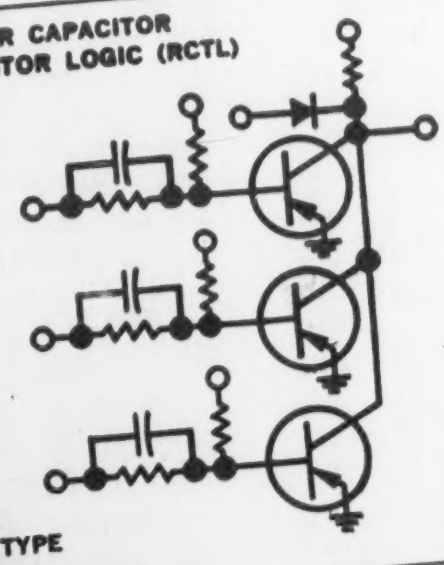
ACHIEVE STAGE DELAYS AS LOW AS 1 NANOSECOND...CLOCK RATES FROM 1 TO 1,000 Mc WITH RCA'S BROAD LINE OF COMPUTER SWITCHING DEVICES

TRANSISTOR RESISTOR LOGIC (TRL)



RCA TYPE	STAGE DELAY (nanosec)
2N585 (NPN ALLOY)	1000
2N404 (PNP ALLOY)	800
2N1301, 2N795 (PNP MESA)	200
2N697 (NPN SILICON)	175
2N705 (PNP MESA)	100
2N706 (NPN SILICON)	100
TA-1882 (NPN UHF MESA)	60

RESISTOR CAPACITOR TRANSISTOR LOGIC (RCTL)



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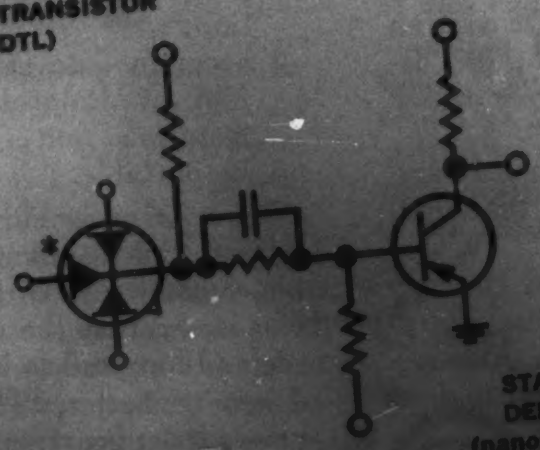
DIODE TRANSISTOR LOGIC (DTL)



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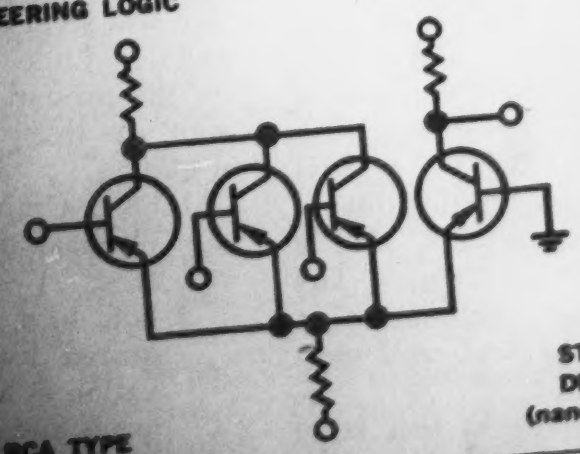

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Call your RCA representative today for further information. For additional technical data, write RCA Semiconductor and Materials Division, Commercial Engineering, Section 14G-NN, Somerville, N.J.

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The previous speaker has stressed, and rightly stressed, the importance of electronics in relation to photography. All I can do is back him up and say that I don't know which comes first. The photographic man has to have some knowledge of electronics and, if the electronics man wants to get his results out on film, he has to have some knowledge of photography.

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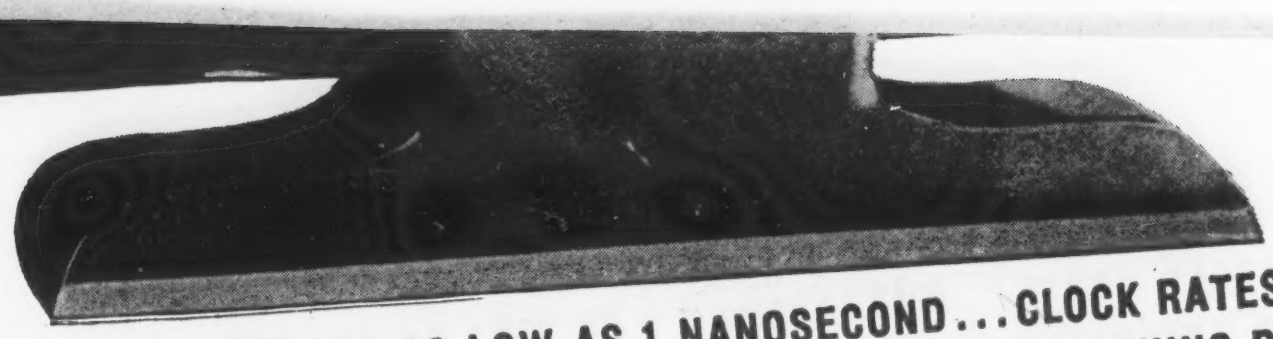

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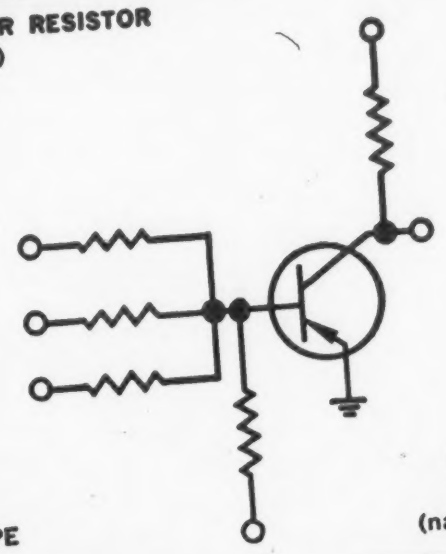

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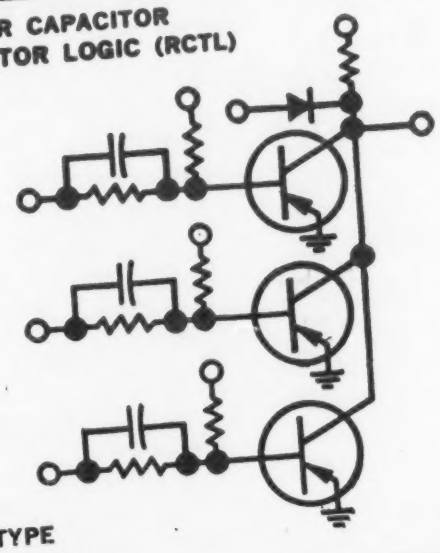

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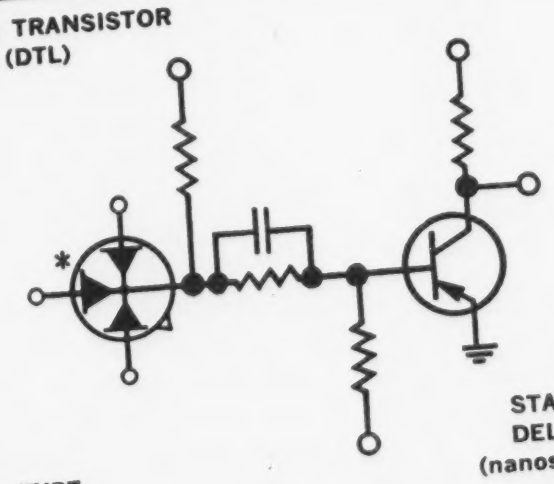

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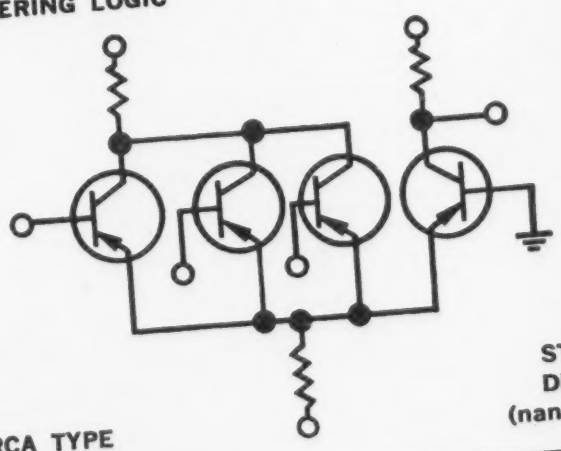

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intent was to supply know-how and aid to anyone in the military who wanted our services. Photo instrumentation has grown by demand, more or less, principally in the Ordnance, somewhat in the Air Force, and a little bit in the Navy. But in the Army, at least, it's an Ordnance function.

The Army Pictorial Center, of course, makes television films, they make training films, and they have processing laboratories with a capacity of handling around 4 million feet of film a month. They have the shops to keep the thing going. It is a natural spot to set up this instrumentation office, and in the the last year, the office that they did set up, I think has done pretty well. In fact, it has almost done too well. We have most of our eggs in one basket. Our intent originally was to supply this photographic know-how and instrumentation service to the smaller organizations that might need it, and to support the larger organizations when they needed extra hands.

An example of what we can do came up last December, when they called us on a Friday afternoon, and said, "Could you be on your way to Alaska by Saturday noon with high speed cameras to photograph the Nike firings up there?" And we were. We got on the road with, I think it was 1600 pounds of excess baggage, and you as taxpayers ought to resent that.

But we got up there. We photographed the firings in Anchorage, and then went back in January and photographed the firings around Fairbanks. The Redstone Arsenal people, who originated the request, said our pictures were a great help to them. In this, we supported the White Sands Agency.

Our main work has been photographing the radar scope presentations as a part of the air defense system. The tests currently are going on here in the eastern United States area. We started in Boston, using about 20 cameras and 25 men. The thing has grown, and next month (July), we expect to have about 75 cameras in the field and about 75 men.

We are photographing in the SAGE Missilemaster control and out at the individual batteries in a 25 mile range around Boston, New York and up in Connecticut.

A ZENITH CAMERA SYSTEM

SPEAKER: DONN L. OCKERT, HEAD OF INSTRUMENTATION AND VICE PRESIDENT, PHOTOGRAMMETRY INC.

A PROTOTYPE ZENITH CAMERA SYSTEM was developed by Photogrammetry, Inc., for the Rome Air Development Center. The system consists of a zenith camera and a control unit which, in turn, contains a special radio receiver for receiving time signals from WWV, a dual channel tape recorder, shutter timers, various electrical interlocks, and a transistor shutter oscillator. The system is a unique combination of photographic, mechanical, and electrical parts.

The purpose of the system is to photograph the stars at or near the zenith and to record other data so that the subsequent measurement of the photographic plate and computation will yield the astronomic latitude and longitude of the camera station on the ground. The aim of the design was to produce a system which would:

1. have a minimum of mental and physical demands on the operator,
2. hold to a minimum the time required for photographic observation at a station (the measurements and computations are done later),
3. automatically record time and camera attitude data to ensure validity of the photographic observation prior to data reduction,
4. accommodate glass plates, sheet film or Polaroid photographic materials, and
5. be portable.

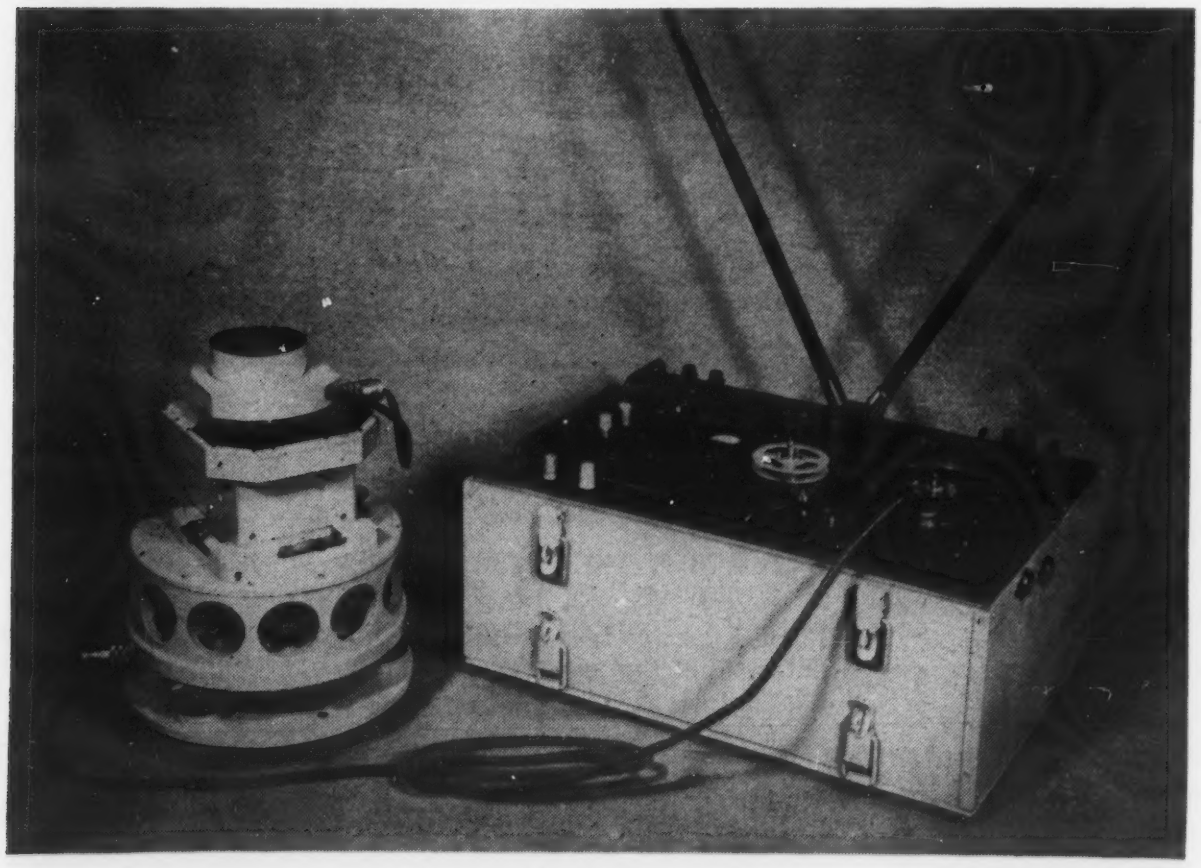


Figure 1. Zenith Camera System

The system is currently undergoing tests and results are not yet available, but the aim of the development is to determine the astronomic latitude and longitude within ± 3 seconds of arc or better. This error corresponds to approximately ± 300 feet on the ground.

The purpose of this paper is to describe this zenith camera system so that others might appreciate the use of electronic and photographic equipment for surveying purposes and, perhaps, use some of the ideas presented here.

The system consists of two major units (Figure 1), the zenith camera and its control unit (Figure 2). The camera is approximately 15 inches high and ten inches in diameter at the base. A single cable connects it to the control unit. The camera lens is a six inch, f/2.5 Wollensak Raptar. The format is a circle 3¼ inches in diameter which means that the camera has a 30° field with the six inch lens. The prototype camera also has provision for a 12 inch, f/5.6 Wollensak Raptar Telephoto to be used as an alternate lens where a longer focal length is wanted at the expense of a narrower field (about 15°). The

lenses are interchangeable.

The between-the-lens shutters of both lenses are electrically operated. Rather than employing the usual principle of opposing a solenoid with a spring so that the solenoid opens the shutter and the spring closes it, these shutters have two solenoids internally switched so that one opens the shutter and the second closes it. This method has the advantage of not drawing current when the shutter is open. The shutter is at rest open or closed. This saves battery power and permits long trail producing exposures if desired. Timing of the opening and closing of the shutters is controlled from the control unit.

The camera is designed to accept sheet film, glass plates or Polaroid film. A film elevator will accept standard 4 x 5 inch film and plate holders as well as the 4 x 5 inch Polaroid holder which is heavier than the others. The elevator lifts the film up to the focal plane defined by a circular machined surface after the dark slide has been removed. In this way the emulsion is brought in contact with the focal plane defined by the machined surface.

Level Bubbles

Although the camera is normally turned 180° between exposures and two exposures are taken per plate, the camera does not have a vertical spindle. Level bubbles having a sensitivity of five seconds per two millimeters and mounted just above the film plane are used to indicate the vertical for each exposure. Leveling the camera for each exposure avoids the inherent errors of a vertical spindle. A fixed bubble technique is employed with the camera; i.e., the camera is leveled by centering the bubbles when the camera is first set up on a station, but thereafter the bubbles are not centered but returned to a small index set when the bubbles were centered. By so doing, any error in the first leveling is duplicated in the second leveling, but because the camera is rotated 180° between these exposures, the errors should arise in opposite directions and cancel.

The level bubbles, the watch, and the handle of a data slide just above the watch are imaged directly on the photographic plate by a special optical system. Illumination of these is provided by small incandescent lamps which automatically come on when an exposure is made. The bubbles and the watch are recorded for both the direct and the reverse exposure.

Only one end of the level bubbles is recorded. This is done to save space and to avoid excessive parallax in the recording system. If the whole bubble were recorded, the ends would be near the edge of the field of the recording lens. Then it would be difficult to see just where the limb of the bubble is under the glass with respect to the graduations on top of the glass. Because the camera should always be acclimated to the local environment it is safe to assume that no temperature change would occur between the time of the first and second exposures so the length of the bubbles would be constant over that period. The small manually set indicator shows where the bubble should be when centered. The amount the bubble has moved between the first and second exposures, which is really a leveling error on the part of the operator, can be easily measured on the comparator. These data may then be used to correct the plate coordinates for this angular error, provided it is small.

The watch is not used to indicate accurate time, although it can be set within a few seconds of the correct time. The watch serves as a sequence counter—the proper sequence of the exposed plates can be determined at a glance. In addition, the watch gives the approximate time which is used to locate the proper section of tape on which the time and shutter signals are recorded. It is also used when identifying the recorded stars in the star atlas. Accurate time is not needed for this operation. The watch is the same type as those used in aerial cameras.

Turning now to the second half of the system, the control unit contains the batteries, shutter timers, camera controls, a dual track tape recorder, and a special products model WVTR radio receiver. The case has provision for storing additional items such as tape reels, earphones, microphones, thermometers, barometer, and radio antennas. The antennas are shown in Figure 1. A three faced mounting for the telescoping antennas permits the use of two as shown or a single one vertically.

Figure 2 shows the front of the control unit. The receiver is shown just above the tape recorder reels. This receiver is made especially for WWV and WWVH, the National Bureau of Standards stations broadcasting time signals. It will receive only these discrete frequencies: 2.5, 5, 10, 15, 20, and 25 megacycles. The output of the receiver is recorded on one track of the dual track tape recorder. The tape recorder is a modified spring driven "Transmagnemite" recorder made by Amplifier Corporation of America. The hand wound spring drive was chosen to avoid expending battery power on the tape drive.

The second track of the recorder records the shutter signal and any voice information the operator may give such as the names of those in the party, approximate location, station number and the like. The shutter signal is a continuous note produced by a small transistor oscillator within the control unit, but the switching of this note on or off is done by the shutter leaves themselves. The shutter signal is independent of

(*Continued on page 22*)

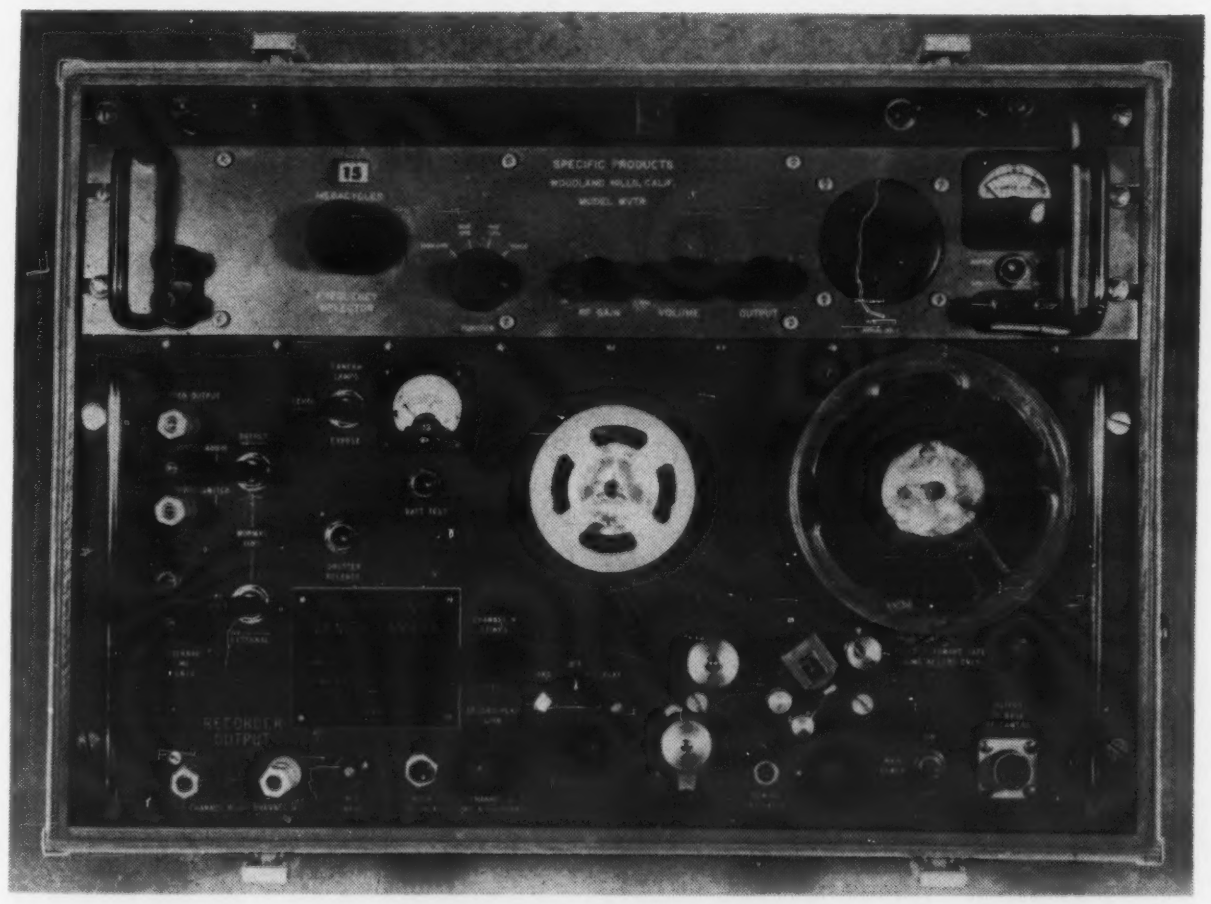
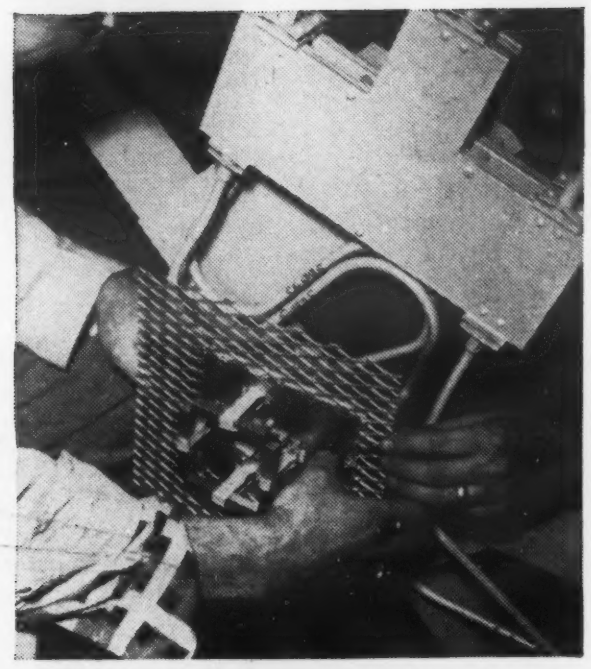


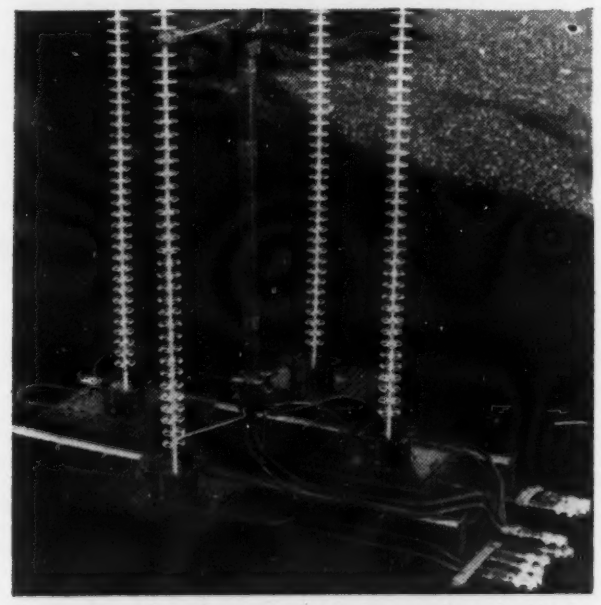
Figure 2. Control Unit



Individual unit assembly is first step in construction of antenna. Here four dipole antennas mounted on ground screen are being connected to one end of Foamflex feed lines. Special Phelps Dodge connectors are used to link the lines to the dipoles and four-way power dividers.

Completed quadrant elements, ready for placement on pedestal mount. Each quadrant is pre-assembled in exactly the same manner.

Completed quadrant elements are raised to platform for placing into position on pedestal mount.



An example of a center element unit that can be inserted into the Avien-Bogner array. This element forms a separate unit that can also be used as a portable ultra high frequency antenna.

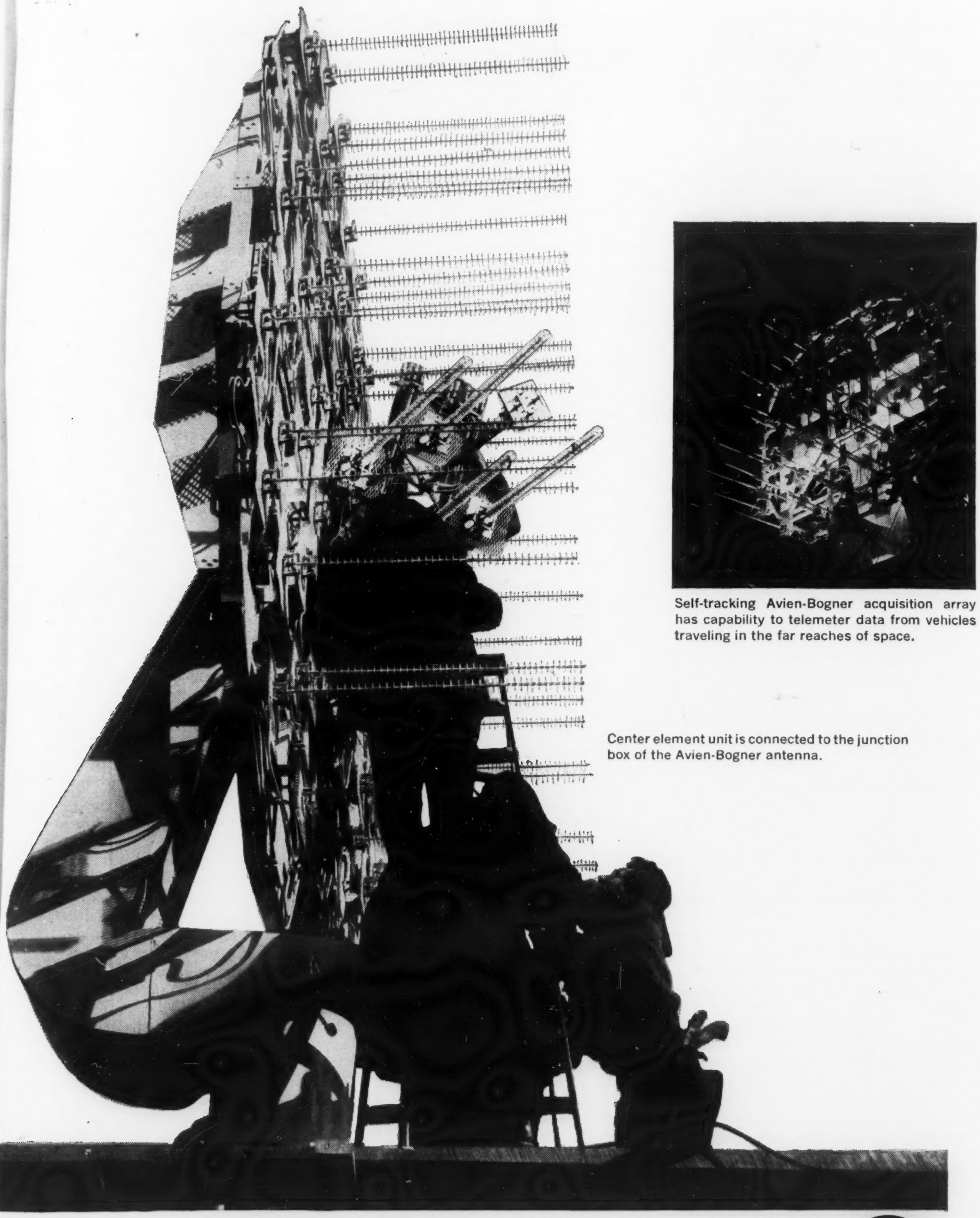
Foamflex® Coaxial Cable helps put and keep this advanced antenna system on the track!

A feed network of ⅜", 50 ohm Foamflex coaxial cable is a critical part of the fully automatic Avien-Bogner acquisition and tracking antenna that represents an advance in the state of the antenna art. The efficient operation of this sensitive antenna is greatly increased by the low loss, high phase stability and electrical uniformity of its weatherproof Foamflex feed line assemblies. Special connectors, designed and fabricated by Phelps Dodge, link the Foamflex lines to double-tuned, strip-line, four-way power dividers in each quadrant element of the antenna.

Designed for Edwards Air Force Base, this modular array is assembled from identical quadrants, each equipped with power dividers, dipole antennas and cigar elements. In contrast to the heavier, fixed-type paraboloids, the lighter, smaller Avien-Bogner model costs less, yet has high acquisition capability for telemetry information through the use of three automatic tracking modes. Quadrant elements may easily be replaced when changes are desired in frequency bands, due to the simple design and construction of this antenna.

The feed system was planned, fabricated, calibrated and installed by A-T Electronics, New Haven, Conn. Accurate uniformity of electrical length for each cable was maintained from cable to cable within one degree at 2200 megacycles after bending.

The outstanding qualities of semi-flexible, aluminum-sheathed Foamflex have been proved in a number of applications where low loss, long operating life and a low noise to high signal level ratio are essential. If your specifications call for a coaxial cable of the highest efficiency, we recommend you investigate the capabilities of Foamflex.



Self-tracking Avien-Bogner acquisition array has capability to telemeter data from vehicles traveling in the far reaches of space.

Center element unit is connected to the junction box of the Avien-Bogner antenna.

Panel Discussions

(*Continued from page* 19)

the shutter power control. In this way, the actual opening of the shutter leaves as well as their closing, is recorded on the magnetic tape. The tape, then, has the one second pips every two inches along one edge of the tape and a continuous note appearing whenever the shutter is open on the outer edge. Because WWV broadcasts a voice announcement of the time every five minutes, the time of opening or closing the shutter is determined to the nearest second simply by playing back the tape. Further subdivision of time is done visually.

Ampex Edivue solution, an extremely fine iron powder in temporary suspension in naphtha, is painted on a section of tape located during playback. The iron powder is attracted to the magnetized portions of the tape, and when the naphtha evaporates seconds later, one second pips and the shutter note appear on the tape. Interpolation with an ordinary 1/50 inch engineer's scale yields time within .01 second. This method requires no special tools, the Edivue solution is stored in the case, and the interpolation may be done in the field or office.

The Control Unit uses a 12 volt internal supply, but a jack is provided for an external source, e.g., a battery in a nearby vehicle. It will also accept an external receiver or supply signals to an alternate recorder. Jacks are provided for the use of a chronometer, as well.

Operation of the System

The system can be handled entirely by one man, but two men are more efficient: one man on the camera and one on the control unit. Operation of the system entails that the camera be set up; i.e., attach the appropriate legs, the cable, and the lens and then place the camera over the station. The camera is then loaded with Polaroid film and leveled (bubbles centered). The index pointers on the bubbles are set to the graduation nearest the end of the bubble. Subsequent setting of the bubble to the index markers requires only about 1½ minutes. With care and experience the bubbles have been consistently set in about 1 minute.

Meanwhile the man on the control unit mounts the aerials and selects the frequency presenting the strongest signals and adjusts the receiver. The tape recorder is started at this point. The signals being recorded can be monitored with the earphones. The cameraman now winds and sets the watch and marks the date on the data slide while the control man records the names of those in the party and the barometer reading.

A complete cycle of two exposures is then taken with no particular care to the levels to check out the system. This makes sure that everything is recording properly. The Polaroid film gives immediate indication of lamp failure or shutter failure. Then the camera is loaded with glass plates, leveled, and the exposures made.

A number of interlocks are built into the system. The cycle for an exposure runs automatically when the exposure button is *released*. The depression of this button does nothing until it is let go. The shutter opens, the lamps come on, and the shutter closes automatically. A second exposure cannot be affected until the camera has been turned 180°. An exposure cannot be taken if the lights are left on.

Because the watch and the bubbles appear on the photographic plate and because WWV now broadcasts the day of the year, hour, minute and second in code along with the time signal, all field operations can be monitored by office personnel. Field personnel need only to operate the equipment properly and record nothing themselves, and the position of the camera can be determined later through subsequent measurement of the plate and computation. The time required to set-up and make a series of exposures is approximately 30 minutes.

ELECTRONIC RECTIFICATION OF OBLIQUE AERIAL PHOTOGRAPHY

SPEAKER: DR. SAMUEL W. LEVINE, DIRECTOR OF RESEARCH AND ENGINEERING, FAIRCHILD CAMERA AND INSTRUMENT CORPORATION

THE TOPIC OF DISCUSSION is rectification of oblique aerial photography. Some electronics engineers may think that we process photographs through halfway rectifiers or something like that. This is not the subject. It is the geometric correction of photography taken from oblique angles.

The problem is the transformation of the oblique perspective of the photograph to the equivalent vertical perspective. The dimensions of the oblique photograph are modified so that it has the appearance of having been taken at a position in the center of the photographic format and perpendicular to the plane of the earth.

From an instrument design viewpoint, it is required that the photographic content of the picture be transferred from copy to print with appropriate distortion of dimensions.

Historically, rectification has been accomplished by optical means. The oblique copy is projected by a lens to an image plane and the geometry is made such that rectification is accomplished. This means of rectification has been satisfactory in the past. However, new developments in aerial cameras and their uses have indicated a requirement for an improved means of rectification. The optical rectifier cannot cope with the higher resolution, unusual types of photography, long focal lengths, high tilt angles and flexibility in regard to various corrections that are now required.

Machine Requirements

Electronic techniques are now being applied to the problem. In applying the technique of electronics to the problem of the design of a machine having the desired characteristics, several dominating requirements must be considered. Resolution of the order of 100 land pairs per millimeter should be approached. Dimensional accuracy of rectification of 100 microns throughout reproduction is a desirable goal. Photographic quality in regard to grade scale range is an absolute must. Time of machine operation should be reasonable, and this should be not more than 15 minutes for rectifying 100 square inches of copy. Focal length capability covering 3 inches to 100 inches is desirable and tilt angles from 0 to 80 degrees should be covered.

In addition, it should be possible to introduce various corrections other than rectification, and, of course, the machine must accept the various types of aerial photography, such as the single frame, vertical panoramic, tip panoramic and slit types.

Finally, the rectifier must not be so complex that it loses reliability and is difficult to operate.

An electronic rectifier utilizing cathode ray tube flung spot scanning in recording has been designed and fabricated by High Crown Manufacturing Co.

The original copy and the recording are placed on moveable plattens. These two plattens are moved in, somewhat in conjunction with each other, depending on what the rectification requirement is.

The photographic information, which we will refer to as video information, is transposed from copy to recording by scanning a cathode ray tube flung spot scanner which illuminates the copy. The optical information is converted to electronic information with a photo multiplier and goes through amplifiers to actuate the grid of another flung spot cathode ray tube. This exposes the film on the recording area, in the recording film.

The dimensional distortion that is required is done by moving the copy platten at a different rate than the recording platten, and having a different linear velocity of sweep speed in the recording cathode ray tube as compared to the scanning cathode ray tube.

In order to obtain high resolutions, the photograph is scanned in segments. In other words, the copy platten stays still for a short length of time, and the cathode ray tube now scans in a direction along the x axis—say, a half inch of copy along the x axis. The copy table transports slowly in the x direction.

As this information is transmitted to the recording, the recording platten moves at the same rate, at a proportional rate, as the copy platten, and the relationship is determined by the transformation requirements of rectification. As soon as one segment of the original copy is scanned, the copy platten then steps forward and, say, the next half inch of the copy is scanned and appropriately recorded. In this manner rectification is accomplished.

Fairchild Camera and Instrument Corporation has delivered to Rome Air Development Center a spot scanning electro-optical rectifier, which accepts oblique plane photography and produces positive prints on papper up to 36 inches by 40 inches in size.

This machine can rectify a frame photograph from 1½ inches up to 100 inches focal length and tilt angles up to 85 degrees from the vertical.

Scanning is accomplished by an oscillating mirror and the video process of photographic information is recorded with an ultrasonic modulator. Built-in electronic analog computers transform the dimensions required for rectification.

In the Fairchild rectifier, copy is introduced on a cylindrical glass transparent copy-holder, and the recording is on a recording cylinder which rotates at constant speeds. Now, the video information is transferred from copy to recording. A curved fluorescent light source is underneath the transparent copy table. The light that goes through the photographic copy is transmitted by a mirror lens to an aperture plate. The size of the hole in the aperture plate, of course, determines the size of the spot scanning original copy.

The light then is converted with a photo multiplier, goes through electronic amplification, and then actuates an ultrasonic light modulator. This ultrasonic light modulator is a very high frequency modulated light source which has a very high intensity.

In this machine the dimensional transformation is accomplished in two separate stages. Along the copy table direction, the copy table moves in at a constant rate. The ultrasonic light modulator moves at a variable rate, depending on what the transformation requirements are. This transformation requirement is solved by an analog computer which draws a Servel system into position. As the rate of the ultrasonic light modulator changes, the width of the line must change. There is an aperture device inside with another Servel device that changes the width of the line appropriately.

In the direction perpendicular to the copy table motion, we get transformation by having the recording cylinder operate at constant speed; but there is an oscillating mirror whose angular velocity varies. The angular velocity of this mirror is controlled by another computer and a Servel device which acts accordingly to give you transformation of your rectification requirement.

Both the Fairchild and High Crown rectifiers have limitations in resolution and speed of operation. In each case the copy is scanned by a spot of finite size. The photographic information within the spot is integrated by a photo multiplier tube into a video or electronic signal having an average value representative of the information in the spot.

The limiting resolution is then the size of the scanning spot. If attempts are made to decrease the size of the spot for increased resolution, problems of signals and noise and speed of recording arise.

These problems are overcome in the design of another electro-optical rectifier now being designed for Rome Development Center by Fairchild. In this design photographic information is transposed from oblique copy to rectified print by optical projection. Transformation of both dimensions of the copy is accomplished using a Servel drive and punch tape derived from a digital computer, much the same as the High Crown machine just described.

With this rectifier, oblique copy is placed on a platten which moves in a horizontal direction. The copy is scanned by a very thin line of light projected from an illuminated slit. A high pressure mercury vapor tube is used as a light source, and the elliptical mirror images the slit in the copy.

Exposure control is obtained by moving a variable density filter between the source and the slit. This is the variable density filter deposited on a cylinder.

If the copy is moved past the projected slit, the scanned information is projected to a recorder cylinder by a high resolution imaging lens.

Rotation of the recording cylinder is pre-programmed to correlate to the rate of scan of copy by the illuminated slit. In this manner, the photographic content of the oblique copy is transferred to the rectified recording. Rectification in each dimension of the photograph is accomplished by utilizing two different optical techniques.

Operation of the rectifier is controlled by several mechanisms programmed from additional decoder reading punched tape. The recording cylinder of the digital decoder is rotated at a very constant speed by a very precise drive and synchronous motor. A tachometer produces a timing signal for synchronizing the operation of the Servels. The tachometer timing signal controls the rate at which the punched paper tape is read. This arrangement eliminates the possible error due to variation in the electrical frequency of the power source to the synchronous motor.

The digital decoder accepts seven level binary code and the punched tape at the rate of six blocks a second, and produces analog signals for operating the Servels. The optical filter controls the light exposure levels so that uniform density production may be obtained.

Because of the basic machine design, it is possible to obtain a change

(*Continued on page* 26)

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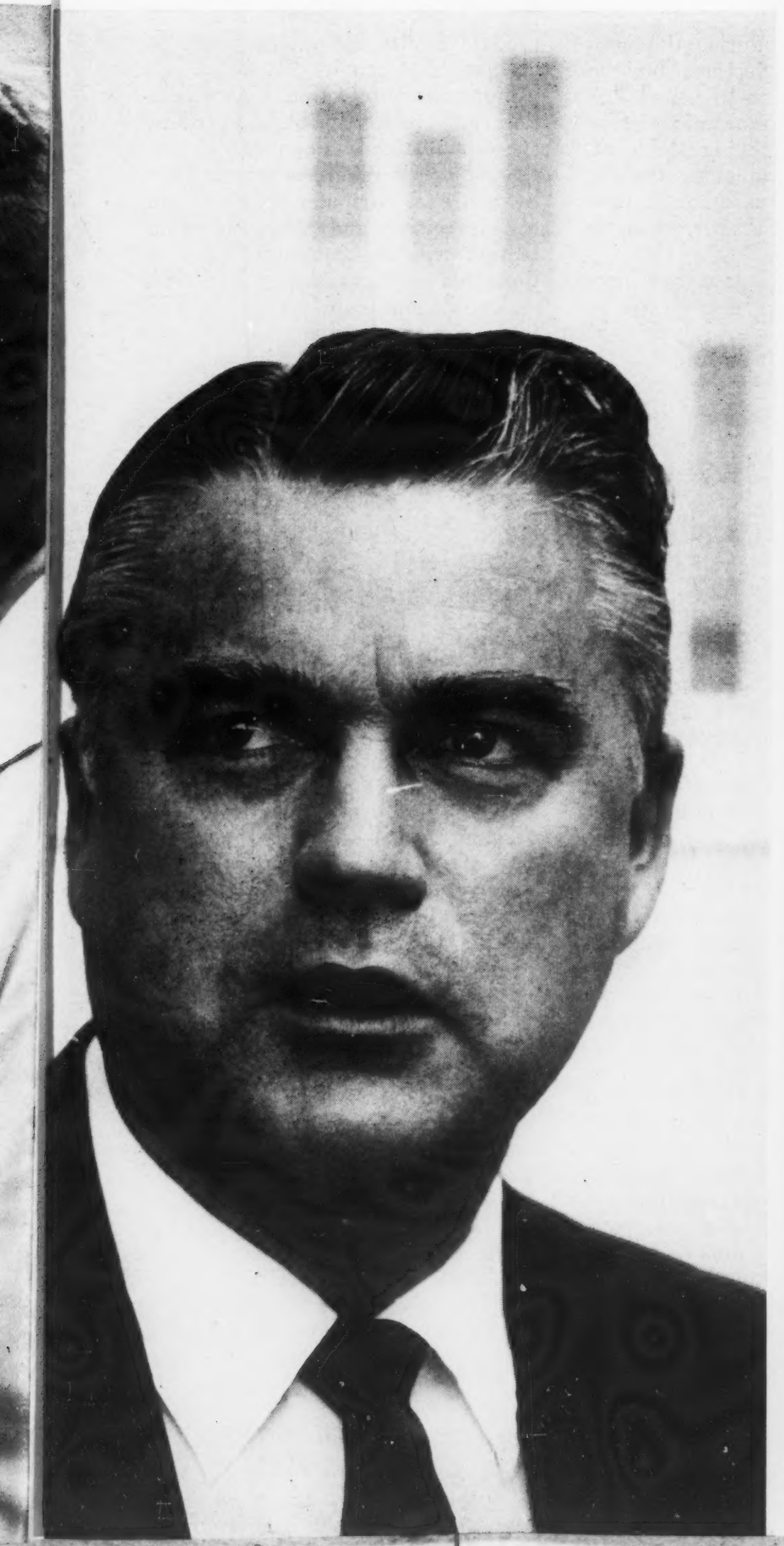


Panel Discussions

(*Continued from page* 23)

of size of the reproduction during rectification. This enlargement or reduction is in addition to the change of size inherent in rectification. It was found desirable to include in the machine the capability of obtaining an enlargement ratio of one half to three; in order to cover this range, it is necessary to use two lenses for projection purposes. Never is a lens changed during a single rectification, of course.

Rectification

The mathematics of single frame photographic rectification has been given previously by the other panelists. Information that is required for producing the punched tape includes tilt angle, swing angle, altitude, camera focal length, desired scale, and various correction factors. As presently designed the machine rectifies copy from 5 inches to 100 inches focal length and resultant tilt angles to 60 degrees, with provision of increasing this copy, if required. Corrections for earth curvature, atmospheric refraction and film shrinkage will be made during the computation of program tape.

The panoramic photography rectification problem can be separated into two types: vertical type, where the plane described by the optical axis to scan is perpendicular to the earth's surface; and the tip panoramic, where this plane is at an angle to the earth's surface.

Rectification of vertical panoramic photography is a simpler case, and can be accomplished by scanning up to 13 inches length of copy in one operation. If the copy format is longer than 13 inches, then the photography is rectified in successive stages.

Corrections for earth curvature, atmospheric refraction and film shrinkage are made during the computation stage. Corrections for the typical S-curve of the principal line equivalent of the panoramic picture can be made by moving the copy platten in a direction along the slit length by the required amount. In a majority of cases this correction is not required.

Tip panoramic photography produces geometry in a photograph in which there is no set of lines that are linear, perpendicular to a principal line. Analysis of the transformation equation indicates one method of rectification which can be used as a two-phased process. The copy is first processed through the machine as though it were a vertical panoramic photograph. The result of this rectification is an oblique single frame photograph equivalent having a tilt angle equal to the tip angle of a panoramic photograph. The single frame oblique equivalent photo which results is then rectified in the machine as previously described. By modification of the machine it is possible to rectify the tip panoramic photograph in one step.

In conclusion, it can be seen that the machine as described can be used to rectify the various types of oblique photography discussed. By using optical projection, high resolution and relatively high operating speed is obtained. By using high precision Servel mechanism drive, driven by a digital computer derived tape, high precision and metric transformation will be obtained. It is felt that this configuration of rectifier makes the optimum use of electronics, optics and mechanics for obtaining the desired performance characteristics.

SOUND FOR MOTION PICTURES AT LOOKOUT STATION

SPEAKER: DR. HOWARD M. TREMAINE, CHIEF OF SOUND DIVISION, LOOKOUT MOUNTAIN AIR FORCE STATION

ALTHOUGH MY SUBJECT is not exactly instrumentation, it is allied very closely to instrumentation because many manufacturers and contractors are faced with the problem of making motion pictures for reporting purposes. And naturally, these motion pictures include sound track.

The system I am about to describe may have a few points that will be interesting to those who may be contemplating producing sound motion pictures. Although this system is rather elaborate, it can be scaled down to fit almost any installation.

Lookout Mountain Air Force Station is located in the upper part of Laurel Canyon, Hollywood, California, under the command of the Air Photographing and Charting Service, Orlando, Florida, who in turn reports to the Military Air Transport Service, at Scott Air Force Base, Illinois. The primary mission of the Lookout Mountain Air Force Station is support of the Air Force missile program at Vandenberg Air Force Base, and support of the Atomic Energy Commission, and other agencies of the U.S. Government, in the production of motion pictures and still photography.

The laboratory is a self-sufficient motion picture producing unit, employing approximately 200 military and civilian personnel, and has been located, at its present site, since February, 1948.

To support such a large program requires rather a large and flexible sound recording division, because different combinations of recording and reproducing media must be accommodated. The sound division records an average of 175,000 feet of sound track per month, about 60,000 feet being optical sound track.

During the early hours of September 5. 1960, a disastrous fire occurred in the sound division, completely destroying the area and about $500,000 worth of sound equipment. The original installation was principally of RCA manufacture, with a few pieces of other manufacture. After a survey of the damage, it was decided that the new sound division should be planned to provide facilities that would permit several simultaneous recording operations, using the latest methods and practices of the industry for reducing production time. Therefore, a program was adopted that would permit a smooth flow of product, while providing convenient facilities for re-recording narration recording, and the transferring of both photographic and magnetic sound track, also the editing of effects and music sound tracks.

Because the Air Force has a large number of RCA recording installations, and the processing laboratories for photographing sound track are set up for variable area sound track. the needs of the Air Force would be better served if the installation continued to use RCA equipment. The majority of the product made at Lookout Mountain is of a classified nature. Therefore, security of the highest order is required at all times. Only those directly concerned with the project and the mem-

(*Continued on page* 32)

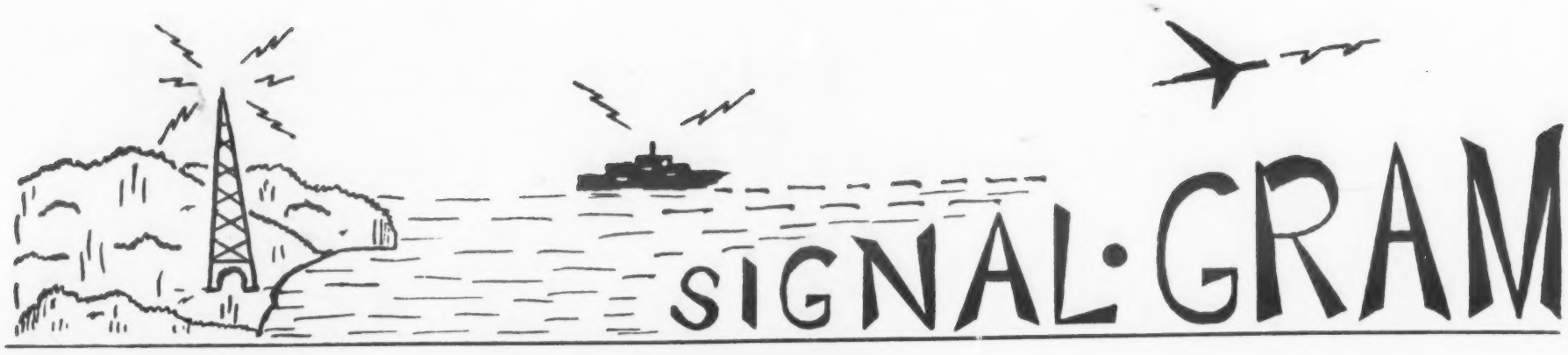
LACK OF RECON–NAISSANCE... ISRAEL'S OPEN DOOR TO SINAI

On October 25, 1956, Major-General Ali Abu Nuwar, Jordanian Army Chief of Staff, declared, "The time has come for the Arabs to choose the appropriate time to launch the assault for Israel's destruction."

Unfortunately for the Arab alliance, they had massed troops and gathered arms, but had not planned for reconnaissance . . . a military basic. On October 29, Israeli task forces slammed into Egypt, capturing initial objectives against confused resistance. Since shell fire and combat had become commonplace along the Israeli borders in 1956, the Egyptian High Command guessed after the first day's onslaught that these attacks were merely reprisals. Lacking reconnaissance "eyes", they could not detect the Israeli deep penetration tactics.

Battling against time as well as the Egyptians, the Israeli strike force often relied on reconnaissance to develop command decisions. For instance, General Dayan, Israeli Chief of Staff, was about to launch his 4th Infantry and 7th Armored Brigades to beef up the attack on the key town of Abu Ageila which was holding the advance. But a reconnaissance unit discovered undefended Daika Pass, 10 miles west, and Dayan poured through his 7th Armored. Abu Ageila, snared in a pincer, quickly fell.

This combat flexibility based on well planned aerial and ground reconnaissance key-noted the Israeli assault . . . helped make the famous Sinai "week-end" War a classic example of textbook military success.



—GOVERNMENT—

EXPANDED CIVIL DEFENSE PROGRAM has been requested by President Kennedy. Mr. Kennedy has asked Congress for $207 million, in addition to the $100 million requested by former President Eisenhower, for civil defense. Most of the new money would be spent on a fallout shelter program. Responsibility for this part of the civil defense program has been transferred from the Office of Civil and Defense Mobilization to the Defense Dept. Highlights of the President's proposed program include identifying and marking available community shelter space in existing buildings; stocking these shelters with "five day austere emergency rations," a two week's supply of water, radiation meters, sanitation supplies and digging tools; installing a warning alarm in the homes.

NAVY OCEANOGRAPHIC RESEARCH PROGRAM calls for spending more than $900 million in nine major fields between now and 1970. Called TENOC-61, the program is the outgrowth of increased Navy efforts in oceanography beginning in 1958, when the Office of Naval Research requested the National Academy of Sciences to form a Committee on Oceanography to recommend a national oceanographic research program. Some of the points included in the program are 1) a marine environment prediction system which will be in operation by 1965; 2) construction of 35 new ships for use in research and survey work; 3) improvements in all types of oceanographic instruments; 4) expansion of research and development facilities at eleven Navy and civilian institutions.

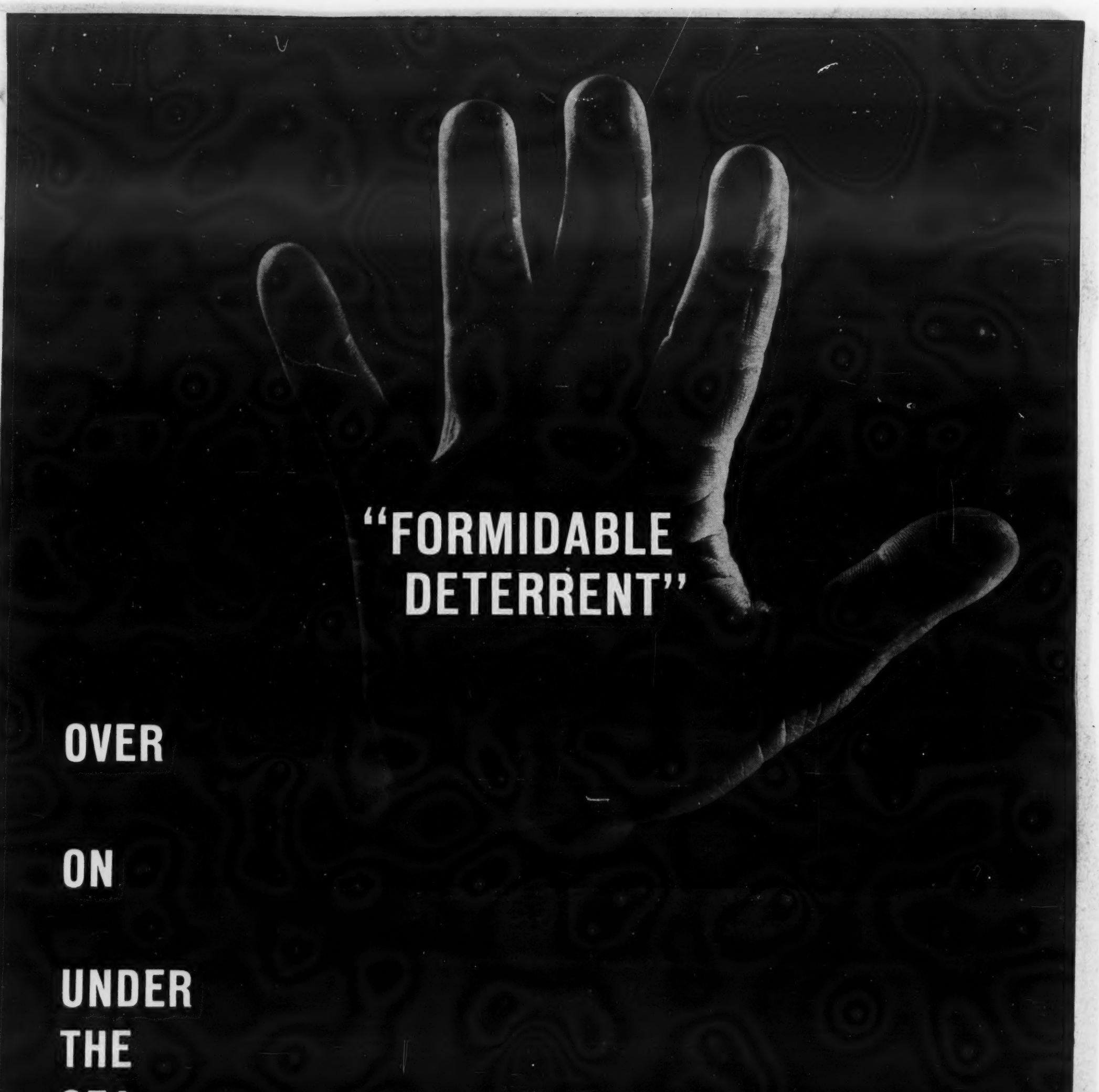
REORGANIZATION OF AF HEADQUARTERS STAFF is now taking place. The principal change consists in combining staff responsibilities for development, procurement, and logistic support of aircraft, missile, space and electronic systems into one office called the Deputy Chief of Staff for Systems and Logistics (DCS/S&L) and in combining staff action on research, advanced technology, studies requirements and development planning into one office called the Deputy Chief of Staff for Research and Technology (DCS/R&T). Lt. Gen. Mark E. Bradley commands DCS/S&L and his office assumes all of the responsibilities previously assigned to the Deputy Chief of Staff for Materiel. Lt. Gen. Roscoe C. Wilson heads the DCS/R&T, which was formerly called the Office of the Deputy Chief of Staff for Development.

DOD PRIVATE LINE COMMUNICATIONS FACILITIES will be centrally managed and leased for the first time beginning in January 1962. Previously each military department has been leasing communications facilities from the common carriers to meet its own requirements. The Defense Communications Agency has been designated the central control point for the management, and the Department of the Air Force the interim action agency for the leasing of all private line communications facilities required in the Defense Dept.

AF BASIC RESEARCH OUTLAYS totaling more than $21.5 million were made by the Air Force Office of Scientific Research (AFOSR) during the fiscal year ending June 30, 1961. One of four basic research organizations of the Air Force's Office of Aerospace Research, AFOSR's primary mission is the support of basic research by either contracts or grants throughout the Western Hemisphere and in those foreign countries not served by the Air Force's European research office in Brussels, Belgium. There were 460 grants, new contracts and contract renewals. Of this number, 357 contracts and grants went to 110 universities and colleges; 103 awards went to non-profit research institutions and industrial laboratories.

DOD STANDARDS OF CONDUCT DIRECTIVE requires that all military and civilian personnel of the Defense Dept. avoid not only any activity which would place them in a position of conflict between their private interests and the interest of the United States, but also all activities which would give an appearance of such a conflict. The directive also establishes a procedure whereby former officers of the Armed Forces who have served eight years or more on active duty are required to complete a form enrolling with the department with which they propose to do business prior to conducting any business with that department.

(Continued on page 30)



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AD HOC SPACE COMMUNICATIONS COMMITTEE is being organized by ten international communications carriers at the request of the Federal Communications Commission and the committee has been asked to submit its report on plans for a commercial satellite communications system to the FCC not later than Oct. 13, 1961. Members of the committee will be representatives of American Cable and Radio Corp.; American Telephone and Telegraph Co.; Hawaiian Telephone Co.; Press Wireless, Inc.; Radio Corporation of Puerto Rico; RCA Communications, Inc.; South Porto Rico Sugar Co.; Tropical Radio Telegraph Co.; United States-Liberia Radio Corp.; Western Union Telegraph Co. The Commission wants the results of the committee's discussions as quickly as possible so that this information, together with all other information and proposals, will enable the FCC to take further steps to achieve the establishment of a commercial satellite communications system at the earliest practicable date.

GE'S AND GT&E'S PETITIONS requesting their participation in the first stages of preparation for a commercial satellite communications system have been denied by the Federal Communications Commission. General Electric Co. and its subsidiary, Communication Satellites, wanted aerospace companies, communications companies and the general public to be permitted participation. General Telephone and Electronics Corp. wished to be considered an international common carrier and thus be eligible for participation. GT&E also requested that domestic carriers be included in the preparatory discussions. The FCC ruled that only international common carriers be allowed to participate in the initial proceedings on the development of a commercial satellite communications system. However, in dismissing the GE and GT&E petitions the Commission did not rule out the possibility that these companies might be included in later discussions. The FCC noted that the petitions were dismissed "without prejudice" to these companies' "further participation in these proceedings."

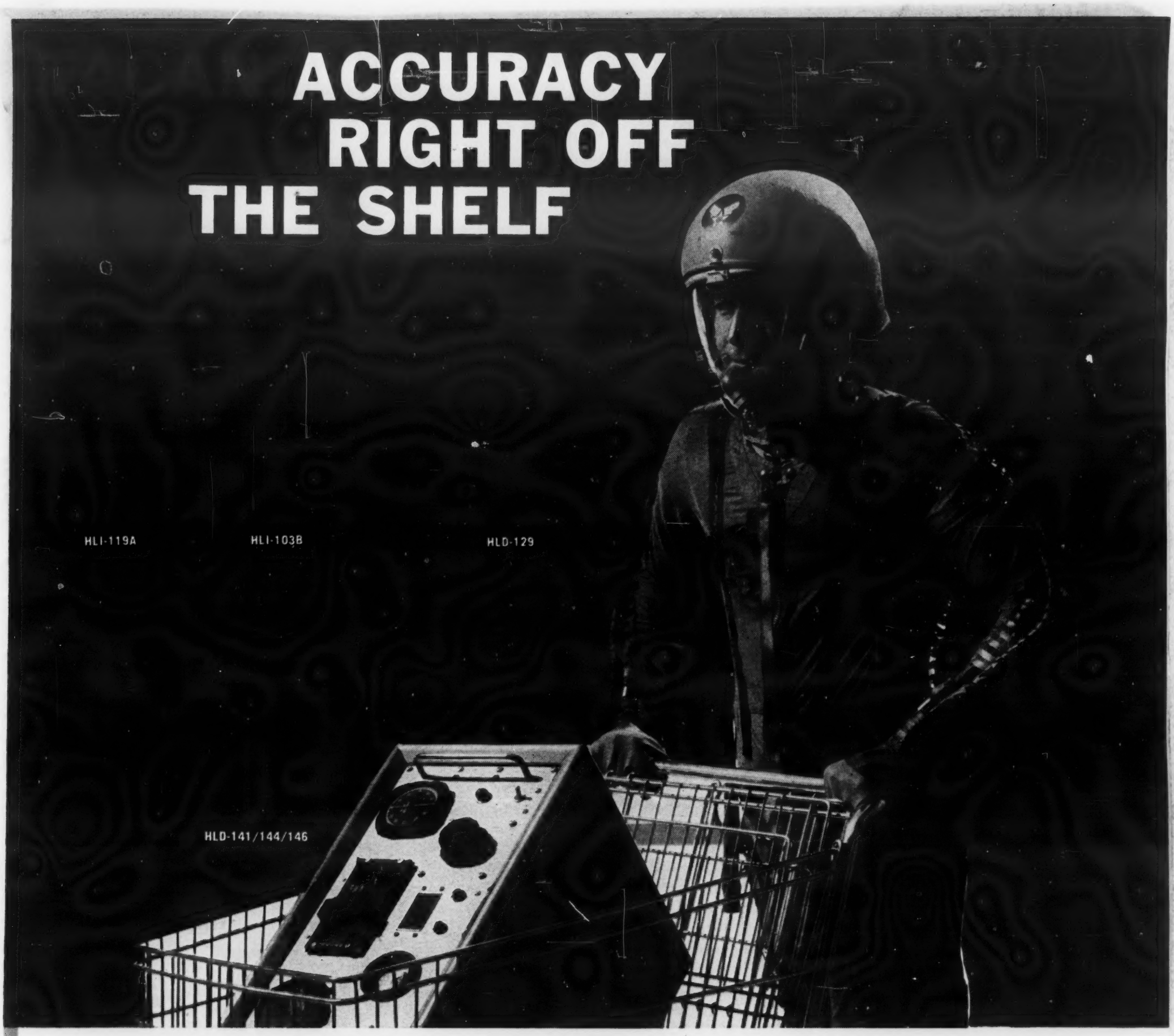
DETAILS ON RELAY SATELLITE PROGRAM have been announced by the National Aeronautics and Space Administration. American Telephone and Telegraph Co. and International Telephone and Telegraph Corp. will make their ground stations available for NASA's use in tracking the satellite. ATT's station is located at Rumford, Maine and the ITT station is at Nutley, N. J. Space Technology Laboratories will assist in project coordination and systems planning for the program. Under agreements approved by Great Britain and France, communications organizations in these countries will participate in Relay experiments and are constructing ground stations for this purpose. As announced earlier, Radio Corporation of America will build the Relay satellite. (SIGNAL, July 1961, p. 26) Relay is the first active repeater communications satellite in NASA's research and development program to determine the feasibility and technology of satellite communications systems.

FOUR COMMUNICATIONS SATELLITE LAUNCHINGS are tentatively scheduled for next year, with the first launching taking place in April 1962. Developed and built by the American Telephone and Telegraph Co., this first satellite will be launched and tracked by the National Aeronautics and Space Administration. ATT will pay NASA for these operations. NASA's Relay satellite for communications, being built by Radio Corporation of America, will be launched sometime in June. The third satellite launching will be ATT's second satellite, which is scheduled for sometime in October. NASA's second Relay satellite will go up sometime in December.

POLARIS UNDERWATER LAUNCHING FACILITY for testing the missile from various ocean depths has been completed at the San Clemente Island Test Range of the U. S. Naval Ordnance Test Station (NOTS). The Variable Depth Launch Facility consists of four separate movable steel spools, stacked on top of each other to form a tower, and anchored to concrete filled steel pilings set deeply in the ocean floor. The $900,000 facility was jointly designed by NOTS and Moffatt & Nickol, Engineers. This facility was constructed and installed by United States Steel Co. and Global Marine Exploration Co., respectively.

ARMY SUPERSONIC TARGET MISSILE, the NA 273, successfully passed its first firing test at White Sands Missile Range, N. Mex. recently. The ramjet-powered missile will be used as a target for U. S. Army Air Defense Command crews firing Hawk and Nike Hercules air defense missiles. Only one foot in diameter and 19 feet long, the NA 273 is said to be the only training missile capable of operating anywhere from 300 to 60,000 feet altitude and from subsonic to supersonic speeds.

(Continued on page 54)



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SIGNIFICANT DEVELOPMENTS AT HOFFMAN HAVE CREATED POSITIONS FOR SCIENTISTS AND ENGINEERS OF HIGH CALIBER, PLEASE ADDRESS INQUIRIES TO VICE PRESIDENT, INDUSTRIAL RELATIONS

(*Continued from page* 26)

bers of the sound division are permitted in the area and then only on a need-to-know basis. Thus, the sound division is acoustically isolated from the other parts of the installation.

The destroyed area of the installation was reconstructed using eight inch concrete blocks. The floor above the sound division consists of two four-inch concrete slabs, separated by two inches of acoustic material. The outer perimeter of the slabs is isolated from the walls of the building by a similar treatment.

The floor of the stage is sloped downwards towards the screen, similar to a motion picture theatre. This design provides a ceiling height of 14 feet at the screen end and approximately 10 feet at the rear wall, behind the mixing console.

To reduce the possibility of noise transference from the projection booth to the dubbing stage, the narration booth and other sections of the division, the air conditioning system is divided into several different separate trunks and fitted with acoustic sound traps in both the supply and exhaust ducts. All doors throughout the sound area are of the Riverbank Laboratory design, each door having 36 db attenuation, except for those leading into the narration and dubbing stage. These doors have a 46 db attenuation. Each door is equipped with an automatic seal at the bottom and around the jamb to prevent leakage at these points.

To facilitate future wiring and equipment changes, all portions of the sound division, except the dubbing stage and power room, are constructed with a false ceiling, covered with removable fiberglas panels. The walls are covered with fiberglas blocks to reduce the noise level created by the equipment.

The dubbing stage projection booth houses two Century 35 mm projectors and one Eastman EK 25 16 mm projector. The Century projectors were essentially built to provide forward and reverse running. With the capability of running the machines in either direction, the mixer can rehearse difficult cues by running the projectors backwards or forwards in synchronization with the equipment in the machine room. Thus, many hours of recording time are saved by this feature, as it eliminates the need for frequent rewinding of possibly 12 sound tracks every time a cue is missed. The EK 25 16 mm projector has also been modified to run in either direction.

The walls of the dubbing stage are poured concrete block. The ceiling surface is broken up into three steps. The side walls are fitted with diffusers panels, each centered on a hard surface on the opposite wall. A polished cylindrical diffuser is placed above the projection booth portholes on the rear wall to break up reflections. Thirty-two seats with an absorption factor of 3.6 are installed in the center portion of the floor. Their reverberation time was originally specified to be 0.8 seconds.

The screen is a Super Optica lenticulated surface, manufactured by the Herlie Screen Company. The surface is perforated, mat white, approximately 19 x 9, supported on a metal frame, hinged at the top to allow the lower edge to swing upward for servicing the loudspeaker system. The center gain of the screen is 1.7 when compared to a freshly scraped block of magnesium carbonate. The fall off is only 1.8 to 1 from 0 to 50 degrees, with a uniform rate of fall off at angles between. The surfaces of the wall behind the screen are treated with four inches of ultra acoustic blanket. The loud speaker system is an RCA PL 302 two way system, employing two 15 inch low frequency units and a single high frequency unit mounted on a horn. The system is fed from the projection booth over a 250 ohm impedence line, then matched at the stage by means of transformers to the lower impedence of the loudspeaker unit.

Mixer Console

Next, I would like to describe the mixer console which is used for monophonic recording. Several of its features are peculiar to our mode of operation, but conform to the motion picture industry standards. The basic design of the circuitry was accomplished by the sound division, then built, wired and installed by RCA.

The mixer circuitry and its components are housed in a metal console, 12 feet in length and 6 feet in depth. The control area is approximately 11 feet by 3 feet. Twelve mixer controls are divided into three groups of four mixer controls each, with an over-all group control. The first group will be referred to as the dialogue section; the second, the music; and the third, sound effects.

The output signal of each group of four controls is combined in a resistive network. The input of each mixer control is normal to the output of a magnetic reproducer located in the machine room. Other reproducing equipment is patched in at the console as it is required.

Two graphic equalizers, manufactured by the Cinema Engineering Company, are mounted at each group of four controls and are actuated by means of four push buttons. A fifth button permits the equalizer to be inserted after the building out resistor of the four controls, to provide over-all equalization of the four controls.

Each mixer control also has a low frequency attenuator equalizer for dialogue. The frequency response of this circuit tapers off slowly to a point where 1,000 cycles is down either 8 or 12 db, with reference to 1,000 cycles. In the off position the frequency response to the mixer network is ± 0.5 db from 30 to 12,000 cycles.

Following the output of the group control is a compressor amplifier with its input and output controls ganged together mechanically, which feed a high and low pass filter. There is also a line amplifier, terminating in a bridging bus. The high pass filter has five cutoff frequencies, 45, 80, 100, 135, and 180 cycles. The low pass filter has three cutoff frequencies, 6, 8, and 10,000 cycles.

Normally, the high pass filter is set for 45 cycles, and the low pass for 6 or 8,000 cycles, depending on the recording media. In addition to the aforementioned items, each group of four mixer controls has a program equalizer with three frequencies of equalization or attenuation, 3, 5, and 10,000 cycles. The equalizer is patched in as required.

Following the building out resistors of the mixer control are the booster amplifier, the group control and the compressor amplifier with its input and seating controls ganged together mechanically. The seating control feeds the high and low pass filters, previously described. At the output of the low pass filter is a line amplifier feeding a dialogue bridging bus. The dialogue bus feeds an isolation amplifier to one input of a resistive combining network for combining the output of the three mixer sections. The output and network feeds an amplifier which drives a composite bridging bus.

To be able to monitor the dialogue, music and effects bridges simultaneously, three amplifiers, one fed from each bridging bus, are terminated in a second resistive combining network, which in turn, feeds the monitoring system. The music

(*Continued on page* 34)

section of the mixer network is similar to the dialogue, except for the elimination of the compressor amplifier. The effects section is also similar to the dialogue, except for the inclusion of a limiter amplifier. The compressor amplifier is generally used as a conventional amplifier; however at times, compressing may be required. If so, it can be keyed in and out of the circuit. The input and ceiling control allows the amount of compression to be changed while the compression ratio remains fixed. The limiter amplifier is operated as a conventional amplifier. However, at times, a small amount of limiting may be desirable. If so, it is keyed in. Meters mounted at the compression and limiter positions indicate the amount of compression being used. The fourth bridging bus, termed the composite bus, carries the combined signals from the three sections of the mixer. VU meters connected across each bridging bus indicate the recording level at each section and the composite bus. The composite bus feeds all recording equipment, except a three track magnetic recorder, normal to the three mixer section outputs. At times, it is necessary to make a fourth. At times it is necessary to make a foreign picture dialogue version of a picture. In the past this required redubbing the picture and substituting the foreign dialogue track. In this system the dialogue, music, and sound effects are recorded separately on a three track magnetic recorder. The new dialogue is threaded up in synchronization and recorded. It might be desirable at times that one of the tracks be used as a guide track, but at a lower level. This may be accomplished by means of a push button at any one of the three mixer positions, which lowers the monitor level 20 db. Normally, this type of transfer would be accomplished in the transfer room by running the dialogue track in synchronization with the other two tracks. However, it may be necessary to see the picture, and if so, it is transferred through the console.

At each mixer position is a remote input and output control associated with an EMT reverberation unit manufactured in Germany. The reverberation unit consists of a metal plate approximately 8 feet by 4 feet, held in free suspension with a dynamic excitor and piezoelectric contact pick up cartridge. An echo is created by decaying of the vibrations induced in the plate or excitor units. The delay period may be varied from the console by remote control which affects a damping member near the plate. The period of reverberation is indicated on a meter at the console.

Duplicate controls for the reverberation meter appear at each mixer section, electrically interlocked to prevent the taking away of the control of the section initiating its use. The use of this new development has eliminated the need for echo chambers which generally require at least 3,000 cubic feet to get any degree of reverberation. Also the echo chambers must be built of concrete and preferably the surfaces should be shellacked or lacquered.

When playing back from a magnetic sound track, it is possible to erase the track by the operator forgetting to throw the machine to its playback position. To help prevent this common error, an indicator light for each recorder is mounted at the left end of the console. As long as the recording bias is on, the pilot light will remain on. Before rolling the system for a playback, the mixer glances at the indicator light to see that the machine is in the playback mode. A similar group of lights are used to indicate if all the machines are back on the line after making a playback. Remote control of the more common functions of the dubbing stage is incorporated in a control panel at the right end of the console.

In addition, a 4-position switch actuates an enunciator panel outside the dubbing stage entrance door identifying the classification of the subject material being worked on in the dubbing stage. These positions are unclassified, restricted, secret and top secret. Repeater panels repeat this information in the sound office.

Before the start of each tape a 400 cycle level tone is recorded on the head end of each sound track at an amplitude 50% of the bus level. This tone is used to establish the proper listening level for playbacks and later to establish the level for transferring.

Setting the listening or transfer level from this tone eliminates variations in the system from day to day. Tone may be applied manually or automatically. In the instance of the three-track recorder, the tone is recorded in sequences for three seconds on each track, for a total of nine seconds. If the tones are recorded simultaneously they will be additive and the level at the composite bus will be an error by about 4 db. To facilitate the testing and the maintenance of such a large amount of equipment all amplifiers and buyer supplies are plug-in type except for the compressor, limitor, noise reduction and recording amplifiers used with a photographic recorder in the transfer channel. Push buttons at each of the three mixer positions operate a selective loud speaker intercom system. In addition, a dial order wire system is available for private conversations with the various branches.

During a dubbing session, the projectionist takes control of the starting, stopping and the reversing of the system. To reduce production time lost during rehearsals due to the threading up time by the projectionist and the machine room operator, the motor system and the recording and reproducing equipment are designed to run both forward and backward. As a rule, about 30 percent of the time consumed in the dubbing session is lost in rewinding the sound tracks and threading the projector. Also when 12 sound tracks are being used at least 3, and preferably 4, machine room operators are necessary. A reversible motor system reduces the number of machine room operators as difficult sequences with a large number of cues may be rehearsed down into a reel without rewinding and rethreading the whole role of sound track.

If a cue is missed the system is brought down in synchronization, then reversed and returned to the point of interest and again reversed. This method of operation is continued until the results are satisfactory. The machines are then rolled back to the start mark and the tape is made.

To eliminate the sound from the reproducers while running in the reverse mode, a muting switch is activated when the machine is running in reverse. The Selsan motor control rack contains selector switches for the three Selsan generators and their connection to the desired motor bus. Lock and run switches, indicator lights, a group of relays for reversing the system, and a remote footage counter mechanism are also mounted in this rack.

To reduce the possibility of clicks and pops in the system caused by the switching of motor circuits and other equipment, all single and 3-phase power circuits are de-popped by the use of silicon diode click suppressors manufactured by the International Rectifier Corporation. For an AC circuit two diodes are connected back to back; while for a DC circuit only a single diode is employed.

To further reduce the possibility

of clicks, all single and 3-phase circuits are tightly twisted for the full length of their run.

Except for the dubbing stage, the transfer room is probably the most important branch of a sound installation. Here the sound track negative is transferred from the magnetic dubbing masters. Transfer is made from one media to another. Because of the many different combinations of media used by the sound division, a unique method of setting the correct equalization for transfers has been incorporated.

When the operator receives instructions to transfer from one media to another, such as 35 mm magnetic sound track to a 16 mm photographic sound track, the film loss equalization will differ for color or black-and-white, 16 mm or 35 mm release printing.

In the past, this required the operator to have an extensive knowledge of the amount of equalization, filter cutoff frequencies, and many other details. In the new installation this is accomplished by setting four dials for information on the master chart. All that is required of the operator is to select the necessary machine and set the equalization dial, the high and the low pass filters, the amount of limiting if used, and the channel gain. The operator then threads up a 400 cycle magnetic leveling loop on the machine which is to carry the master track and adjust the system gain for 100 percent modulation on the VU meters. As all of the settings are predetermined, the level of the recording galvanometer on the photographic recorders will be approximately correct.

A program of transferring several hundred thousand feet of 35 mm magnetic optical sound track to one-quarter inch magnetic synchronization tape using the ranger tone equipment has been instituted. This method reduces the storage space required in the vault to approximately one-tenth that now required.

The transmission laboratory is the quality control center of the sound division. The equipment in this area is used for measuring the frequency response of the various sections of the recording channels, such as amplifiers and magnetic reproducers and measuring the signal and noise ratios, distortion and many other tasks required on such equipment.

Daily tests are made through the console to assure a uniform daily product. Other tests are made weekly and monthly, depending on the order of importance.

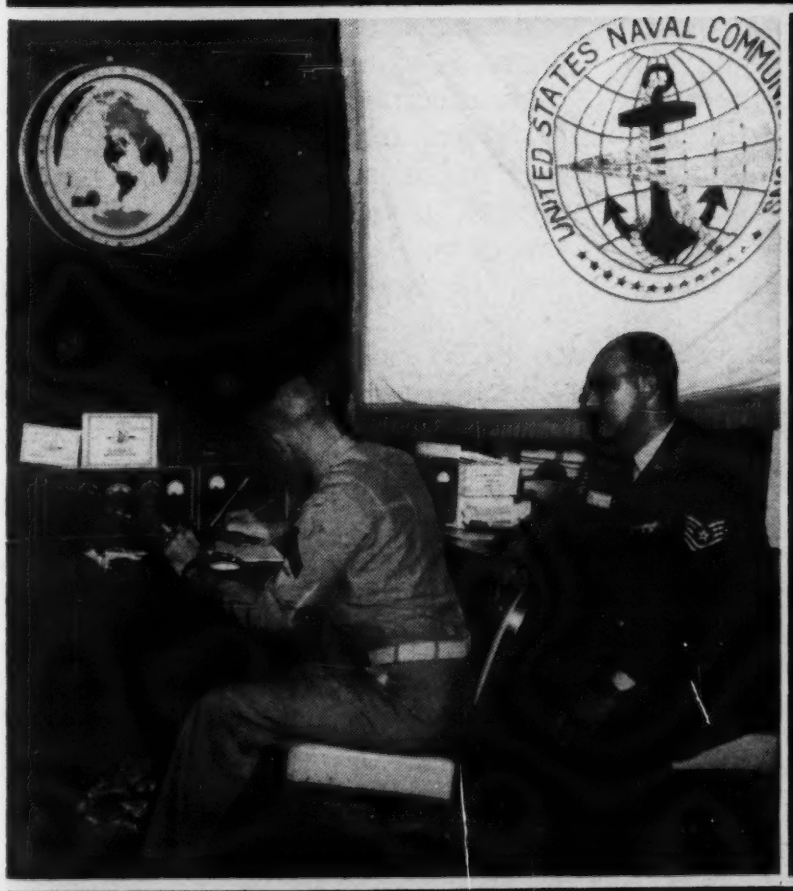
The transmission laboratory is equipped with five projection rooms. Two of these rooms are in the vault area where all film is screened and inspected before shipment. One of the two rooms is equipped with two RCA model 400 16 mm projectors, and the other two with special high-speed projectors running at 140 feet per minute, exposing simultaneously two of the picture frames and the sound track.

Two other rooms are placed back to back utilizing a common projection booth. One side of the booth is equipped with 35 mm equipment, 35 mm projectors, and 16 mm projectors. The other side has a special machine which will project 16 mm pictures in combination with 35 mm magnetic or optical sound track. Sixteen millimeter composite film using magnetic or optical sound track may also be reproduced on this machine. For answer print evaluation an Eastman EK 25 projector is employed. The fifth projector room is that of the dubbing stage previously described. For purposes of quality control the light and sound levels are measured daily in all rooms using a Panavision brightness meter developed by the Motion Picture Research Council.

The location equipment consists of two magnasynchronized portable recording channels, using 16 mm magnetic film. To further facilitate location recording, several one-quarter inch rider perfect tone channels are being put into operation. These channels use a 60 cycle pulse on a one-quarter inch tape supplied from a small generator mounted on the camera motor housing. The tapes are transferred to 35 mm magnetic film in the transfer channel.

In the course of producing motion pictures, the laboratories are often called upon to cover large areas of operation. It is mandatory that instant and reliable communications be available with ground vehicles, aircraft and camera positions. This has led to the establishment of a radio network composed of 40 mobile and 7 base stations at Vandenberg Air Force Base and 5 mobile and 1 base station at the laboratory.

As stated at the beginning of this paper, Lookout Mountain Air Force Station is a complete motion picture producing unit requiring many support activities including writers, producers, cameras, sound, editorial, processing, laboratory, and many others. Our camera department has over 400 different types of cameras, about 40 to 50 cameramen normally, and sometimes many more.



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PANEL ON

RECENT DEVELOPMENTS IN GOVERNMENT CONTRACTS AND PROCUREMENT PROCEDURES

By FEDERAL BAR ASSOCIATION

MODERATOR — E. K. GUBIN, CHAIRMAN, TRADE ASSOCIATION LIAISON SUBCOMMITTEE ON GOVERNMENT CONTRACTS AND PROCUREMENT — INTRODUCED BY FRANK WOZENCRAFT, ATTORNEY AT LAW

DOD DISPUTES AND APPEALS PROCEDURES

SPEAKER: JOEL P. SHEDD, MEMBER, ARMY PANEL, ARMED SERVICES BOARD OF CONTRACT APPEALS

No matter how well Government contracts are made and administered, disputes will arise. In recognition of that fact the Armed Services and other Government agencies have established a Disputes Procedure as set out in the Standards Disputes Clause included in Government contracts together with certain other contract provisions, such as a changes clause, to provide a procedure under which the Government can obtain the supplies, or work, that it needs for its purposes so that the military establishment can accomplish its prime mission, notwithstanding the occurrence of a bona fide dispute.

The value of the procedure is that even though there is an honest difference of opinion over what the contract calls for, the Government can require the contractor to continue performance and deliver supplies to meet these military deeds regardless of how reasonable the contractor's own interpretation may be. The work proceeds notwithstanding the dispute, while the contractor is protected by a provision under which he can register his complaint. If it turns out that the contractor is correct, he is taken care of price-wise.

The dispute procedure may be divided in three steps. The first step, which I think is the most important, is settling the dispute at the local level by mutual agreement between the contractor and the Government contracting office. Most disputes are settled in that way. However, if that procedure is not successful, then the Government contracting officer renders a unilateral decision deciding the dispute. Sometimes that decision is satisfactory to the contractor and the matter is ended. However, when the contractor is not satisfied with the contracting officer's decision, he is given a right to appeal to the Secretary or his representative —the Armed Services Board of Contract Appeals.

A hearing is held, and the decision is then rendered by the Board. Thus the contractor's rights are safeguarded in that even though the matter is decided initially at the local level by persons close to the problem, he has the protection of having it decided *de novo* at a higher level by a Board not emotionally involved in the dispute. The Board fortunately does not have to decide a great many disputes in comparison with the total number of Government contracts, but we do decide a sizeable number—several hundred a year—and these decisions of the Board, which are published and available to members of the Bar and other people who have interest in Government contracts, provide certain guide lines to the Government and to industry, as to how government contracts will be interpreted.

I think the decisions provide a rather important body of contract law with considerable influence in the procurement world.

I would like to discuss an area in which the Board has rendered a number of decisions of particular interest to the electronics industry. The electronics industry constantly is involved in contracts to produce end results which have never been achieved before. History has constantly faced the challenge of being called upon by the military to achieve a scientific breakthrough. These scientific breakthroughs are made quite frequently, but it does not follow that every attempt is successful. Sometimes a contractor undertakes to do something which turns out to be unattainable.

We lawyers refer to this as impossibility of performance. Impossibility of performance in a legal sense, i.e., from the standpoint of impossibility of achieving a desired end result, means something that is not absolutely impossible, but is so extremely difficult or very expensive as to be impracticable from a standpoint of feasibility.

We have a good many cases where contractors have entered into contracts to achieve something that has never been done before and the result is that the process is prostrated, and the parties are disappointed—they don't reach the results that are hoped for. We are talking about impossibility not in the subjective sense of a certain contractor not having the know-how that is customary for his industry, but rather in the sense of something beyond the state-of-art of the industry. Two cases with recent decisions by the Board will illustrate the problem. In the Austin Case, the David Taylor Model Basin wanted to develop a computer system which would record certain reactions on shipboard and transmit the data instantaneously to shore to record it in a very precise fashion.

The Navy had set up a design for the system based on certain scientific concepts. Members of the industry convinced the Navy people that their plan was impractical. One of the prospective contractors, the Austin Company, submitted an alternative proposal which the Navy accepted and the contractor entered into a 6-part contract to do the job.

After working on it for quite a long time and spending a hundred thousand dollars in excess of the contract price, the contractor was unable to achieve the result which seemed originally to be feasible from a theoretical standpoint. Due to a phenomenon called jitters they could not achieve the precision that was called for. The Navy terminated the contract for default. The result was that the contractor was paid nothing for all the work and all the expense that it incurred on work which proved to be of no value to the Navy.

The contractor appealed insisting that the failure to perform was due

to causes beyond his control and without his fault or negligence and that it was impossible even beyond the state of the art. The contractor wanted the contract converted to a termination for convenience of the Government, under which it would be paid for all its costs up to the contract price. The Board of Contract Appeals denied the appeal. It held that under the facts and all the surrounding circumstances the contractor had entered into the undertaking in which it had assumed the risk of achieving a successful result, that it went into the matter with its eyes open knowing that it was a contract to do something that had never been done before and had assumed the risk that its plan, its proposed method, would be successful.

Another case decided only a few months ago is the E. L. Cournand Company case involving another Navy contract for making some containers for component parts for guided missiles. It was a combination plastic, fiberglas container that had to meet certain rigorous requirements. First, there was a research and development contract, but before a prototype had been developed that met all tests, the Navy entered into a production contract to produce items which were to conform to Government drawings and specifications but to achieve a certain performance end result.

The contractor was unable to achieve this successful result. The contract was terminated for default. In that case the Board held for the contractor. The Board held that the contractor's failure to perform was due to impossibility and had the termination converted to a termination for the convenience of the Government under which the contractor was reimbursed for its costs.

It might be rather difficult for a layman to distinguish between these cases in terms of the contract which were very much the same. I don't believe a layman would be able to predict just what result the Board would reach in such cases. The results turn very much on a careful analysis of the facts of the case; the ultimate decision in each of the two cases mentioned was based on what the Board decided to be the intent of the parties with respect to the assumption of risk of the result being unattainable.

There is a general principle that the Government warrants the correctness and adequacy of the Government specifications. And there have been many cases where the Board has granted price increases to contractors because of defects in Government specifications. And the general rule where the Government prepares specifications, if they prove to be inadequate or incorrect, not only is the contractor relieved from strict compliance with them, but sometimes he is paid the full contract price even though there has been a relaxation of the specifications. Thus if he has expended or incurred great expense in trying to achieve the unattainable, he may be granted a price increase for producing an end result that is less than the contract called for.

RECENT LEGISLATIVE AND OTHER DEVELOPMENTS AFFECTING PROCUREMENT IN THE ELECTRONICS INDUSTRY

SPEAKER: JOHN G. GREGG, GENERAL COUNSEL, OFFICE OF THE CHIEF SIGNAL OFFICER

THE DEVELOPMENTS that are happening today point up the necessity for reminding ourselves that this key concept of the industry and government team and particularly in the field of the preparation of contracts, is more true today than it has ever been before.

The preparation of a contract is no longer a mere technicality. A proper preparation of a contract can mean dollars and cents to the corporation, and it can mean the expenditure of time, administrative burden, and money to the government. As recently as a few weeks ago, the Comptroller General came up with a decision which reaffirms what I am saying. A contract was awarded to a bidder who was a non-conforming bidder. The contract on its face was perfectly proper. It had all the necessary signatures and all the seals and the pages were numbered. There were a lot of clauses and everything looked just fine, but the bidder was a non-conforming bidder. Because of this, on protest, the Comptroller General said, cancel this contract. The contractor may only be paid the price of those items which he has already delivered and with respect to the whole inventory of items that he has not delivered, he is out of pocket.

The contractor is out of pocket and the Government is out of pocket because they had to go through this whole process of reprocurement and recontracting and all the rest of the costly process. So, gentlemen, these are not technicalities, these are dollars and cents.

Copyright Law

Let me go briefly to a development in the field of copyright law. As you probably all know, the old rule was that you could not sue the Government for copyright infringement. Unfortunately, we Government employees were in a bad situation, because the law held that where the infringement took place, and it was within the scope of our employment, we were personally liable for copyright infringement. I am happy to say that the Congress has seen fit to change this and the remedy today for copyright infringement which was in the scope of the Government employees' employment, is against the Government for infringement. And, incidentally, this is a sole remedy. You may no longer sue the employee; you have to sue the Government.

There is another point we might touch on lightly. I am sure you are all watching rather closely developments in the field of conflict of interest and standards of conduct. The most recent development is that President Kennedy, in order to forestall a crash approach to the passage of new legislation, has selected an eminent lawyer, George Magruder, to look into this field and come up with a report.

In the meantime, Secretary McNamara of the Defense Department has come out with a new directive on standards of conduct. Essentially, when you strip away the verbiage, the new directive restates the old theory that in dealings between Government employees and contractor employees, propriety is the order of the day. The appearance of the evil is just as bad as the evil itself.

I would like to discuss briefly an area which is arousing a considerable amount of interest and again which concerns dollars and cents. This is the newly developing field of torts in connection with Government contracts. One of my associates, John McIntire, a very eminent lawyer, has discussed this subject at a recent seminar at some length, and I would just like to reiterate that some of the recent cases in this field now indicate that where contractor employees are working together with Govern-

ment employees, even though the contractor is an independent contractor, the mingling of these Government and contractor employees may give rise to relationships under which injuries occurring to contractor employees may be recoverable as against the Government. In other words, there is a new awareness of Government liability in connection with some of the work under these contracts. I think that an awareness of this situation might be helpful to both sides.

Some recent cases in which employees were hurt falling from scaffolds have also pointed up the fact that recovery is possible; although in some of these cases you get into technical difficulties or legal technicalities and the question whether or not the injuries took place on Government property comes into play, and whether or not the property bears exclusive jurisdiction. We won't go into these legal technicalities at this time. Suffice it to say this is a field that bears watching and the government lawyers are scurrying to the books to find out just what the nature and extent of it is.

I would like to discuss now the White House Executive Order because whether we like it or not I think this is one of the most significant executive orders ever issued. It has tremendous possible impact and many people read about it and talk about it, but very few people have examined it first hand. I will just briefly review the Executive Order as it is written and see if we can develop from it an awareness or an understanding of help to us.

I think the most important thing about this Executive Order is perhaps hidden in a "whereas clause," and this may show the philosophy of the clause. "Whereas a review and analysis of existing Executive Order practices and Government agency procedures relating to Government employment and compliance with non-discrimination provisions reveal an urgent need for expansion and strengthening of efforts to promote full equality of employment opportunities."

This means that whatever has gone on before is unsatisfactory. I think this, in a way, gives you the springboard for the order. Now we go from here to Part I, which has to do with the establishment of the President's Committee on Equal Employment Opportunities. We don't have to say much about that except that key Cabinet members and the Vice President are included.

The next Part of the order is non-

discrimination in Government employment. I don't think much need be said about that. I am delighted to say that in my opinion the Government has been well in the forefront in this field.

Part III is the one that we are most interested in because this is the part that tells the contractor and tells industry what is expected of it and it tells in some way what is expected of the Government. It provides that,

"Except in contracts exempted in accordance with Section 303, all Government contracting agencies shall include in every Government contract hereinafter entered into the following provisions: . . ."

This means *every* contract, and, believe me, this does not mean that by labeling a piece of paper a purchase order or a CSA or some other technical name you will be able to avoid this. This means contract, and it means what it says.

The next obligation is one imposed on the contractor. It says:

"The contractor will not discriminate against any employee or applicant for employment because of race, creed, color or national origin."

Here is a new requirement: "The contractor will take *affirmative action* to insure that applicants are employed and that employees are treated during employment without regard to race, creed, color or national origin."

What is affirmative action? At this point, we do not really know. Perhaps the recent newspaper reports on the Lockheed situation might give you some idea of what is anticipated here; something by way of public pronouncements, perhaps; something by way of agreements, perhaps, with the contracting agency. This requirement is in a formative period and much needs to be developed on it.

The next obligation is that the contractor will in all solicitations or advertisements for employees placed by or on behalf of the contractor state that all qualified applicants will receive consideration for employment without regard to race, creed, color or national origin. The question has already been asked, particularly with respect to the small contractor, "Am I to be required to use this exact language in a two-line advertisement for employees?"

The answer which has been forthcoming to date is "this is the order; you will follow it." I have the feeling, however, that there will be some adjustment in this area in the near future.

The next obligation is a new one and one that places the President's Committee and the Government agency right in the middle of the relationship of the contractor and his labor union. This is a rather delicate area but the Committee, I am sure, feels quite confident that it can make strides in this field and has no hesitancy in approaching the problem. The contractor will send to each labor union, with which he has a collective bargaining agreement, a notice to be provided by the agency—that is, the contracting agency — advising the union of this particular program.

I don't believe any of the agencies, as yet, have prepared such a notice. I believe the President's Committee is working on one which will be suitable and will be forthcoming.

The next obligation is that the contractor will permit access to his books, records and accounts — not only to the contracting agency, but to the Committee for the purposes of investigations.

In the next obligation the contractor shall file or cause each of its subcontractors to file compliance reports. These reports shall contain information as to the practices, policies, programs and employment statistics of the contractor, and note of each subcontractor and shall be in such form as the Committee shall prescribe.

One other obligation is that whenever the contractor has a collective bargaining agreement with a labor union, a compliance report shall include such information as to the labor union practices and policies affecting compliance.

These, for the most part, are the obligations placed on the contractor. Perhaps the most important obligation, and one which immediately raised the greatest fuss, is the obligation that the contractor shall comply with all the rules and regulations and directives of the new Committee. You may have read in the newspapers the first thing that happened with the new order was a reluctance on the part of some of the textile industry in the South to accept contracts containing the new clause, because of this very provision. And they argued through counsel, "why should we take a contract which would bind us to do something which a Committee is going to write about in the future when we do not know the nature and extent of what this Committee is thinking and the direction in which it is going?"

This made a valid argument but, frankly, if you get back to reviewing your current contract you will find that in many ways you are equally bound under the old contracts and in other areas—such as Walsh, Healey

and Davis-Bacon, where a change in regulations by the Secretary of Labor is binding. From this standpoint, there is really nothing startlingly new about this particular obligation. I understand that the textile problem was solved satisfactorily.

The next Part of the order has to do with sanctions. On sanctions—and this is extremely important—first, the Committee may publish, or cause to be published, the names of contractors or unions which it concludes have failed to comply with the provisions of this order.

Next, the Committee may recommend to the Department of Justice appropriate proceedings to enjoin violations of the provisions. They may also request the Department of Justice to bring proceedings for the furnishing of false information, if the contractor has given any false information with respect to the program. And, finally, and perhaps most importantly, the Committee may terminate or cause to be terminated any contract or any portion thereof for failure to comply with the provisions of the contract. This means failure by either the contractor or his subcontractor. Contracts may be terminated absolutely, or continuance of contracts may be conditioned upon a program for future compliance.

This is about the extent of the order, and I would like to conclude by making this statement which bears no stamp of officialdom: I would say that no contractor whose management people have a healthy attitude toward this program need much worry about relationships — at least with the Department of Defense—where we are approaching the implementation of this program with a great deal of sensitivity and, I hope, intelligence.

THE USE OF INCENTIVE TYPE CONTRACTS AND VALUE ENGINEERING

SPEAKER: GERRITT WESSELINK, DEPUTY GENERAL COUNSEL, USAF

ONE OF THE COMPLAINTS industry has in connection with renegotiation is the belief that the military departments give them all of those incentive type contracts, and they give them an incentive profit and after industry gets real pleased about what they have and gets ready to spend their profit, the Renegotiation Board comes around and takes it away from them. "What is the sense of going through all of this business of incentives and all these particular types of contracts when it really doesn't mean anything from the point of view of dollars and cents to us in the long run?" says industry.

Well, we in the Air Force, still believe in incentive type contracts. I am sure that you all know something about the incentive type contracts. We have several kinds of incentive type contracts, but basically in the incentive type contract you negotiate a target price which includes a target cost and a target profit and, if you beat the target cost at the end of contract performance, you get a chance to share in whatever you saved in costs with the Air Force or with the Navy or with the Army, whoever it may be. If you go over the target cost then you share that additional cost with the Government. We have a little formula ranging anywhere from 80-20 to 95-5 depending upon whether or not the savings which we think you can get is a real hard job or whether it isn't going to be too difficult.

Industry feels that if the Air Force, for example, allows you $20,000 or $200,000 as an incentive profit that this profit should be set aside and be exempt from renegotiation; that renegotiation should clobber you only for your sins and not for your virtues. Some people feel that because through an incentive type arrangement we have given them this incentive profit and given them the $200,000 that this establishes their virtue and they don't want anybody to say this is sin.

The fallacy with that argument, of course, is that the Renegotiation Board does not say that what we have considered to be virtue they consider to be sin. They, through their regulations, have recognized the fact that if you have been awarded some incentive profit through an agreement with a contracting agency that this should be taken into consideration in determining whether or not the Board should take more money away from the contractor. Industry generally would like to have that philosophy put into law. They say that although it's in the regulations, nevertheless, the Board doesn't pay much attention to it.

A couple of years ago we in the Defense Department suggested that such a provision be put in the Renegotiation Act and that it should be amended to take care of this type of thing. We did not say, or go along with the concept that incentive profits should be exempt, that these incentive or bonus profits should be set aside and not be considered as a part of the negotiation picture at all. We did say that by law it should be a factor that would be taken into consideration by the Renegotiation Board.

I think this question is going to come up again. We are going to continue incentive contracts; we still believe that they afford a vehicle and a technique by which we can get lower pricing and we are going to push for them; we haven't been disillusioned one bit about it. I hope you people haven't been either, because, as far as I am concerned, you are going to have to live with us and you are going to have to accept our theory and our philosophy about incentives. However, I mentioned previously General Accounting Office and Congressional criticism of the incentive type systems.

Unfortunately (from the point of view of industry), General Accounting Office and the Congress have found instances where certain of these incentive type arrangements have existed with unrealistic targets, and the incentive profits which you have earned and which we have allowed to you have not been because of efficiency but because of the fact that we didn't know what we were doing.

When you start with that type of an atmosphere you aren't going to find that any relaxation of the law in this respect is going to be particularly palatable because the people that are going to have to change the law are the very people who have been criticizing it. I don't think that 1961 and 1962 are going to provide a proper climate for any change in connection with the Renegotiation Act to make the incentive type profits or bonus profits, whatever you call them, inviolable or exempt from renegotiation, and I predict that, as far as the law is concerned, the Renegotiation Act will very likely be continued and it will very likely be continued in relatively the same fashion that is on the books today.

I am not suggesting there isn't some point to the fact when a company has earned an incentive bonus because of efficiency of operation, not because of luck or because of underestimating a target price, that the company is not entitled—from my own point of view— to have that profit set aside for consideration. I do not think, however, that if you have been particularly virtuous in connection with one or two contracts so as to be entitled to a bonus profit that if you had been inefficient in other areas, that the Renegotiation Board in looking at it from an overall viewpoint cannot say on the overall you had better return some money. I think they have to consider your situation in connection with the bonus profits as well as the other areas in which you have not distinguished yourself because of efficiency.

Another subject I would like to discuss is the concern of the electronics people at missile sites. Our problem there has been largely a problem of jurisdictional disputes. We also have been getting flim-flammed a little by prices paid for labor, but our problem essentially has been, at least in the Air Force, some of the things done in the electronics field at missile sites that have been considered to be subject to the Davis-Bacon Act either because they were being performed at the site of the work where construction was going on, or because certain things were traditionally construction type activities.

We haven't necessarily agreed with that, and it has been a matter of great concern to us because it has slowed our missile production and the building of our missile sites.

We have had situations where we feel that the Davis-Bacon Act has required some amendment because we cannot seem to get across that certain things like the installation of electronic equipment, even though it may be involved in the over-all construction of a big hole in the ground, is not necessarily something which should be handled by the construction trade or the trade unions and that if an electronics manufacturer wants to install that type of material with his own industrial type labor, he should be permitted to do so. Perhaps the Davis-Bacon Act should be amended as some industry people have suggested to get back to the old real estate concept of it. Equipment such as electronic gear which is being installed, even though it is on a construction site, should be able to be handled by the industrial type people that the contractor or the electronics manufacturer may wish to employ.

It must be remembered that the Davis-Bacon Act does not say that in a construction site we have to use the trade union or the construction worker type of thing. The Act states that we have to pay a certain minimum wage if the Davis-Bacon Act is applicable. Unfortunately, from our point of view, this has developed into a situation where it becomes a question of not how much a person is going to be paid, but who is going to do the work.

President Kennedy has recently issued an Executive Order in connection with this matter of missile sites and the handling of this type of thing. The Executive Order contemplates some sort of voluntary compliance. There is going to be a big commission and there are going to be site committees.

I can't tell you how this thing is going to work. I can suggest some of the problems—one of them has already arisen—that are going to result from this Executive Order. For example, if the Commission should decide, in order to avoid a labor dispute, that work ought to be subcontracted to a construction contractor who hires straight union or the construction workers, and the particular contractor was able to do that with his own employees at considerably less cost, what is the position of the contractor?

I think it is rather clear that if the contractor is the cost type we will have to foot the bill for this type of compliance. If we assume he is a fixed price type of contractor, is he, or will he be, entitled to an equitable adjustment because of the fact that we have, as a result of the directions of this particular Commission and in order to avoid a labor dispute, changed his method of performance of the contract?

This raises several problems. In the first place, the determination of the equitable adjustment may be rather difficult. If the contractor were required to go through a lengthy strike or a labor dispute he may, in effect, be a lot better off paying a little more money now as a result of an agreement than taking the losses incurred as a result of the strikes which resulted. This is all a very difficult matter. There is also a question as to whether or not we will be required to have placed in contracts an agreement by the particular contractor or sub-contractor that he will comply with the Executive Order of the President. All of these things are still in a state of flux. We don't know just where we are going to go on that. We hope the Executive Order will, to a certain extent, solve some of the problems as far as missile site strikes are concerned and that we will be able to get on about our business. However, if it should result in uneconomic practices so that we will be paying through the nose in order to get labor peace, there is some question as to whether that would be desirable.

A recent newspaper account told of an Air Force contracting officer at Cape Canaveral who had decided a $5 cost of living or travel allowance would be given to union members under certain circumstances. The question was whether this was an economic factor and whether or not he would recognize that as a proper cost for the contract. He decided that it was not a proper cost. If it should develop that the President's Commission should decide that this is a proper way of doing things, then I would assume that very likely we would have to recognize it as a cost and the contracting officer would have to change his decision. Sometimes the contracting officer is going to have to decide questions of cost and the allowability of cost before the basic question for the proper decision of the situation, insofar as the President's Commission is concerned, has been decided.

My personal viewpoint is that we are going to have to take a position whereby we will say that we've got to see how this thing is going to happen. I don't think that we can afford to indulge in uneconomic practices and make allowances if situations justify labor fees at these missile sites. I also think that we must insist that the Davis-Bacon Act perhaps be amended or that we have to look at it from the point of view as something a little different than the way it has been interpreted.

In the Air Force we take the position that if any construction over $2000 is involved in a contract, even though it is for the building of a missile in these mixed contracts where we have research and development, construction and production and everything else, and if it is a separable part of a contract, it should be covered by Davis-Bacon.

This is not necessarily the belief of the Army and the Navy, as I recall. They follow the ASPR provision to the effect that if the construction or the maintenance type of work is incidental to other type work which is not Davis-Bacon, then Davis-Bacon will not cover it. The Labor Department takes the same position as the Air Force has in that respect, and we

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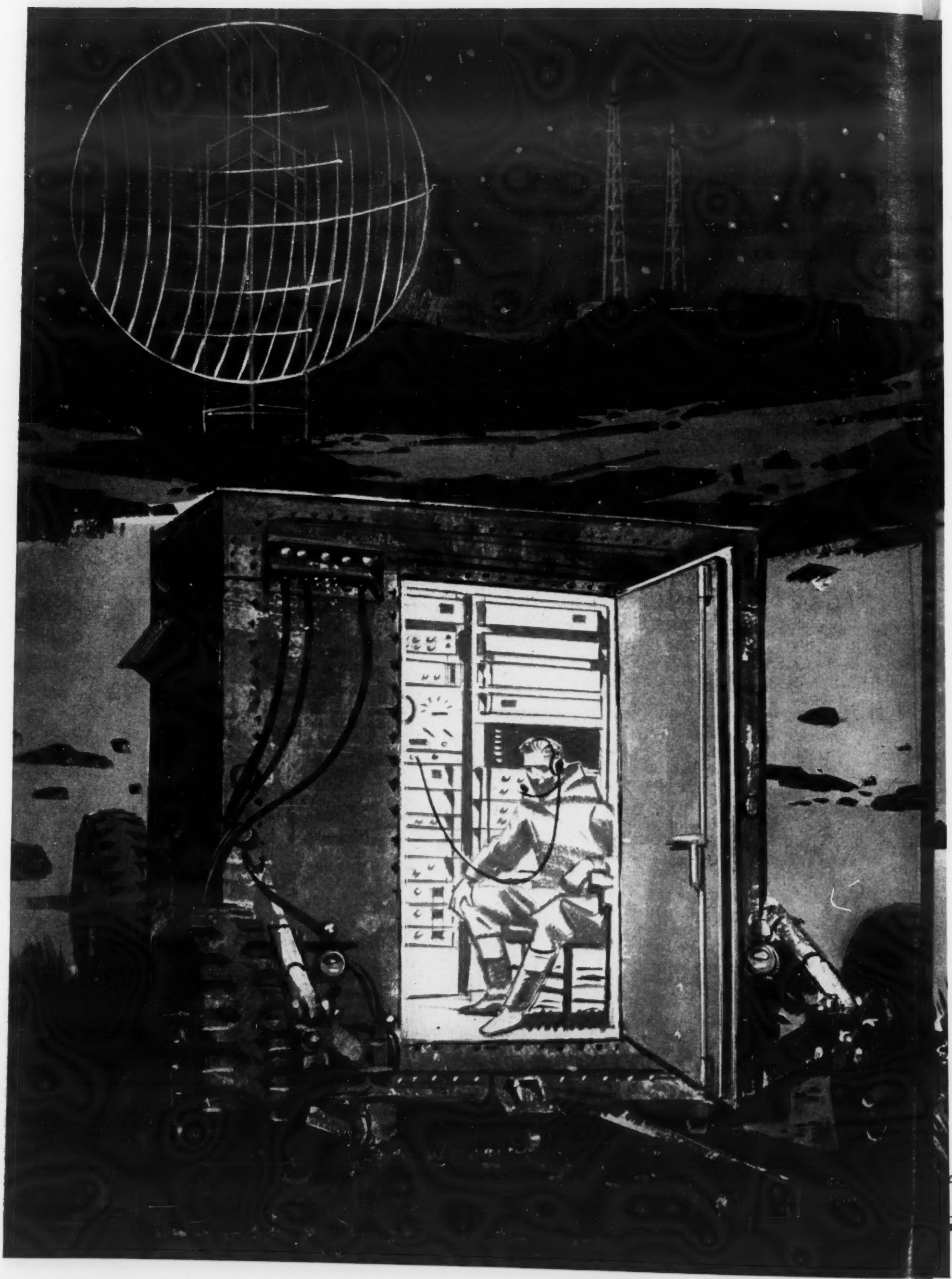

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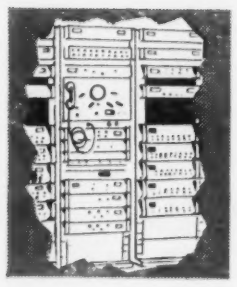

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have so interpreted it. Some of you may have heard about some criteria we attempted to put out because of the problems we were having in determining what was or was not subject to Davis-Bacon. In other words, if we had a great big black box and we had some cables running through it which had to be connected and run under ground, we would say the laying of that cable is Davis-Bacon, but if it involved connecting running wires, electrical wire into the black box itself, we would say that isn't Davis-Bacon.

I understand that those criteria which we established, or attempted to establish, were never approved by the Secretary of Labor. Nevertheless everybody knows that they are out and they expect us to comply with those criteria to some extent. It is my understanding—and this is pure and simple rumor—that the Secretary of Labor may issue criteria in relation with Davis-Bacon coverage some time in the near future. It is also my understanding that there may not be public hearings in connection with these particular criteria which are to be established.

I know that industry and the unions are both insisting upon hearings if any criteria are to be established. What is going to develop in that respect I don't know.

In connection with discrimination and non-discrimination which John Gregg told you about so very well, one of the young men in my office participated in the Lockheed agreement at Marietta which was the new or the starting point on getting this non-discrimination policy set up in industry.

I can assure you that the President's Committee and the President himself are very, very insistent that this program is going to work and I can also assure you that there will be very vigorous effort to comply. The President himself witnessed the signing of that particular agreement and there will be others within the very near future.

There is a recent decision of the Controller General which is important in the area of two-way advertising, where we felt we might have trouble. In two-step advertising we ask for technical proposals without prices and then we negotiate to see whether or not the proposals meet our performance specifications. Those people who then become eligible from the point of view of having submitted a satisfactory proposal are then asked to submit prices on an advertised basis.

Recently a contractor came in wanting to submit something other than the technical proposal which he had submitted which had qualified to come into the competition for price. He said that if he were not permitted to change the first proposal that we would be blocking all types of progress, as we would not permit him to use other materials than what he had originally intended to use even though they were better. He was thinking, of course, that he now wanted to use materials that were cheaper that he found out about after his first proposal. But the Controller General said, "You are in the game on the basis of the ball you were playing with on the first round. You are going to have to play with that ball when you submit your price."

In other words, if the man submits a technical proposal, and it is true we are evaluating apples and oranges, once he has made a bid and a price, he must not only comply with the performance specifications of the Government, but he must also submit something to us and give us something identical to the item he said he was going to give and on which he was judged qualified.

RECENT AND PROSPECTIVE DEVELOPMENTS BEARING ON THE ARMED SERVICES PROCUREMENT REGULATIONS

SPEAKER: GEORGE W. MARKEY, JR., ASSISTANT GENERAL COUNSEL, USN

THE CONSTITUTION of the United States provides that Congress shall have the power to promote the progress of science and the useful arts, by securing, for limited times, to authors and inventors, the exclusive right to their respective writings and discoveries.

The soundness of this provision of the Constitution is well-supported by the remarks of the author who indicated, "He who invents a machine augments the power of man and the well-being of mankind."

It may be, in passing on a familiar saying. "Necessity is the mother of invention," we should not forget that, if such is true, the copyright is the father. And this brings us right back to the year 1790, when Congress, acting on the power which the Constitution gave it, went forward and enacted the first law giving copyright to inventors. This amounts to a limited monopoly for the inventor for a period now of 17 years, although presently there is a bit of legislation in Congress which extends that period where equity demands it. Its purpose being that during the period the inventor shall have the exclusive right to exploit the invention in the hope of receiving a pecuniary reward for his long toil and labor, if that be the case, or for the flash of genius which may have resulted in the invention.

Government Rights

There is, at the present time, one aspect of the field of inventions and patents that is of great concern to those of us who are concerned with military procurement, and I am sure to those of you in industry who have the same concern or interest in military procurement. This aspect relates particularly to the field of Government sponsorship of research and development work, and gets down to the question of what rights the Government *is* getting to inventions under such contracts and what rights they *should* be getting.

The present DOD policy, which has been in existence in the Department of Defense for many years, has been that the Government would take only a license (royalty-free, non-exclusive, world-wide) in all of the inventions first conceived or first produced in the course of Government research and development contracts. Consciously and deliberately, the policy was to leave with the contractor the full title to the invention, with the deliberate purpose of providing a means for the commercial exploitation of that patent.

This particular policy, with respect to contractors, is considerably more generous than the Government policy in regard to its own employees where a different rule applies. Inventions rising during the course of employment belong to the Government, or the Government has precedence.

This policy of the Department of Defense has been under challenge. There are sound reasons why it was adopted. They are now being put to the test. The arguments in favor of

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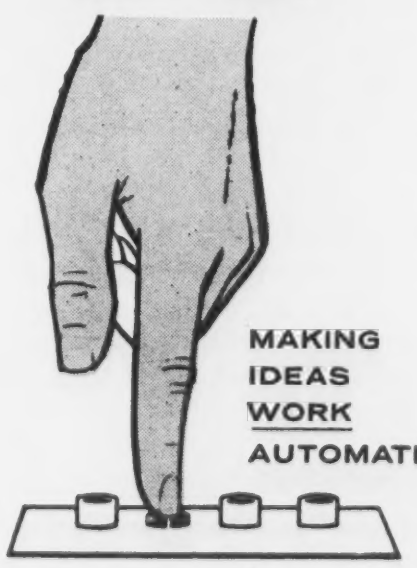

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this policy are that the Government, as far as the military departments themselves are concerned, needs only a license in order to get its job done. If the Government took title, and in some cases it has done that, it apparently does not result, some say, in real exploitation of the patent and in the use and working of the patent. If not resulting in an actual suppression of exploitation, the Government taking of title comes perhaps close to that.

Another argument in favor of this policy is that it provides a very useful incentive to contractors, the chance of commercial exploitation and, furthermore, if the contractors have their own background rights and patents, they will not be deterred from using their best know-how and proprietary rights at various times in the development of what the Government needs. So far as the military departments are concerned, our needs are naturally for the most advanced technology that anyone in industry can supply.

On the other side, the Senate Committee on Monopoly headed by Senator Russell B. Long has challenged this policy very strongly over a period of three years. Senator Long has made many speeches on the floor of the Senate; the Committee has studied the policy. There was a bill introduced last year; there is another bill, introduced this year (S-1176), on which hearings are being held by a sub-committee of the Senate Judiciary Committee headed by Senator John L. McClellan. Senator Long takes the position that this present policy has contributed to increased concentration of economic power; it has deprived the small business community of free access to the use of developments, thereby restraining small business survival and growth contrary to the national interest. In short, he takes the position, without going into all the arguments, that if the Government pays, the Government must own, and he points out that this is the general policy followed in industry; furthermore, that the policy with respect to contractors is inconsistent and indefensible when contrasted with the policy held with Government employees. Senator Long believes the public fund should belong to all the taxpayers and that the public should have free access to the fruits of what their money has produced.

These are cases, of course, where the Government has paid the full freight. Government agencies have not had a uniform policy in this area. There are some agencies that are controlled by statutes. Notably, the Atomic Energy Commission requires the general rules title in the Government. The same is true of the National Aeronautics and Space Administration. In the case of the National Science Foundation, their statute provides more flexibility and allows rights to be determined as may appear to be in the best interest of the Government. They generally follow this policy in the National Science Foundation and the Department of Defense. The policy has existed for many years.

A year ago NASA attempted to get their law changed and understandably so because they have many of the same contractors that deal with the military departments. The committee that undertook the study of that bill, Overton Brooks' Space Astronautics Committee of the House, passed it on to the Mitchell subcommittee which came up with a thoughtful study that took a middle ground approach and came up with an expression of Congressional intent which the Department of Defense thought had much to recommend it. As a matter of fact, at the beginning of this year you will find a new patent policy in the Armed Services Procurement Regulations Act (ASPRA) which does recognize that there are certain areas in which the interests of the public probably demand that the Government take title.

An example of this would be found in a new technological field where there has been no prior non-Government experience and where an invention resulting from Government sponsored work could well dominate the whole field. Secondly, when the contractor is mainly supervising or coordinating the work of others should he have rights, he might well be encroaching on private advantages that emanated from the ideas belonging to others.

An invention in a field directly relating to the health and safety of the public, if such an invention could be, would not be discouraged from practice without patent incentive.

The manner in which this was put in the ASPRA regulations made it a deviation for the contracting officer to take title. It opened the door, but said he had to prove his case and get a deviation. This aspect of it was rather severely criticized by Senator McClellan, indicating that the burden should not be placed on the contracting officer in such situations, but rather the burden should be passed to industry to say why they should not give title.

This middle ground, in other

words, if defensible at all, they thought should be based on passing the burden to the industry in the manner that applies in the AEC and in the NASA statutes. It is interesting to note in mentioning NASA, that this year they seem to have grown cool on their previous recommendation to move towards the Department of Defense policy and in testimony before the present hearings before the McClellan committee, the General Counsel indicated that NASA could live with their present policy.

It will be very interesting, I think, for those of us who are concerned with procurement in the military departments as well as for you in industry to watch the development of these hearings, the subsequent debate on the floor of the Senate and House which I am sure will come, and the ultimate results that may come from it. Involved in the discussion is the thought that there might be a new federal agency to protect the rights of Government in inventions and in discoveries.

I would like to pass on now to the second subject, labor surplus area and small business concerns. Shortly after President Kennedy came into the White House he asked that everything possible be done to put business into labor surplus areas and asked for techniques to be developed to accomplish that. The Department of Defense thought immediately of one technique which has been used in the case of small business set aside where they permit not only the partial set aside which starts out as a formally advertised procurement or half of the procurement or some predetermined amount and then the side that is set aside for small business or labor surplus areas, as the case may be, is then passed out on a bid-matching procedure, based upon the price that is determined in the unrestricted advertised portion.

DOD thought, however, that the total set aside, might be useful. They knew that this would cause some problems because of the history of the Armed Services Procurement Act which, as you may recall, has in it a policy statement saying that it is the policy of the Act to favor small business wherever that can be done.

When we originally came through in the early days of the Act and attempted to use that factor in connection with the provisions of the Act which say that awards shall be made to that responsible concern whose bid conforming to the invitation is most advantageous to the Government, price and other factors considered, they thought that in a very close case among the other factors, you could consider the fact that the concern was a small business concern. The Controller General held this could not be done in the area of formal advertising but that it was perfectly permissible in the negotiated field and the price differential could be paid there.

The Controller General turned us down on this point in a recent decision that I won't go into. The old Brockton Shoe case is the basis of it, if anybody has an interest in following it up.

Recently the main purpose of the turn down is that each appropriation act since 1954 has in it a provision stating that no funds appropriated by that act could be paid out for the purposes of relieving economic dislocation and that has been held to apply to labor surplus area concerns but not to small business.

In the matter of metered mail, regular mail and late bids, there has been a long-established policy that metered mail and regular mail would be treated exactly the same for purposes of considering whether or not a bid was late.

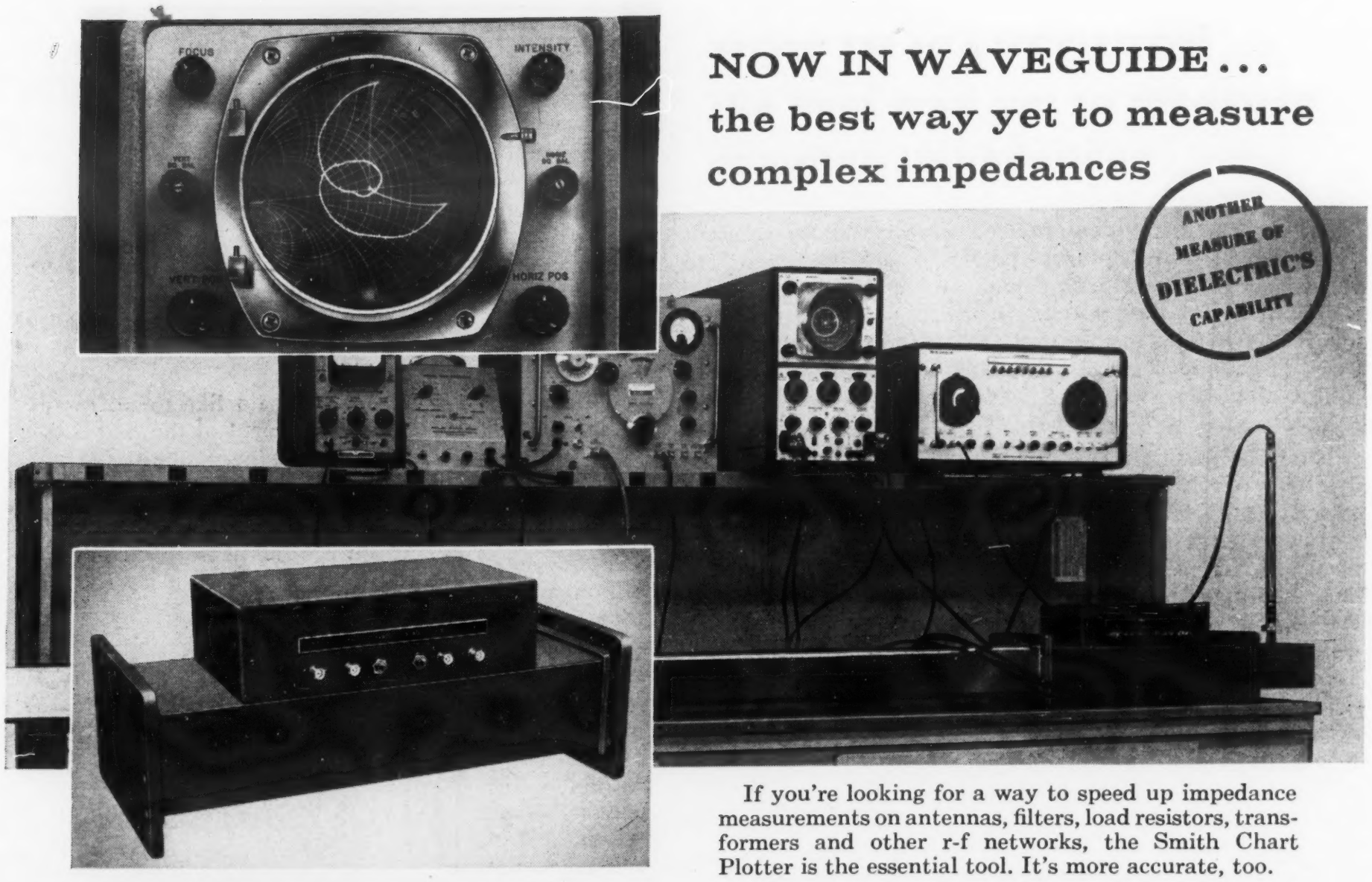
The stamp on a metered piece of mail was the same as that of one going through the post office through the regular mails in order to establish prima facie proof of mailing. Actually, this wasn't merely a matter of equating the two systems; it really gave quite a considerable advantage to the metered mail, because that stamp is placed on the envelope when it is in possession of the bidder and in the normal course of business it would be several hours or perhaps a half-a-day or longer before it arrived at the post office, assuming no improper practices of any kind.

In a recent case the Controller General recommended, in a situation where a late bidder admitted that the stamp was some 24 hours earlier than when it actually got to the Post Office, that henceforth the policy should be changed and that unless the cancellation stamp of the Post Office also appeared that no recognition should be given to the metered stamp.

A request recently came into DOD from the maker of most of the metering devices with the full support of the Post Office Department and suggested that nothing be done to downgrade the status of metered mail in relation to regular mail. The request was apparently the result of both not only his own selfish interests, but

(*Continued on page* 51)

NOW IN WAVEGUIDE . . .
the best way yet to measure complex impedances



Here is the first major breakthrough in the measurement of complex impedance over a band of frequencies. For speed, simplicity, and reliability, it surpasses anything yet used. It's the Smith Chart Plotter, developed by Dielectric Products Engineering Company to obtain instantaneous Smith-Chart display of reflection coefficient as a function of frequency.

Recently 50-ohm coaxial models were announced. *Now these instruments are available in waveguide as well.* Five resolver models span the range 350 to 12000 mc/s. Calibrated mismatch loads are also available.

This unique instrument — along with appropriate auxiliary equipment to form the complete plotter — eliminates the need to tie up highly skilled technical personnel during prolonged test routines that characterize slotted line measurements.

HOW IT WORKS

With Dielectric's Smith Chart Resolver, a swept-signal generator sweeps repetitively over the frequency band desired. The reflection coefficient of the unknown load is resolved into its X and Y components, which are then applied to the X and Y amplifiers of an oscilloscope equipped with a Smith Chart faceplate. A continuous trace of reflection coefficient versus frequency is thus displayed directly. The faceplate can be either a full-scale chart, or one expanded to 1.5:1 VSWR.

As load changes or adjustments are made, impedances change. Simultaneously so does the trace . . . load changes are observed immediately. When a permanent record is required, the oscilloscope trace may be directly photographed. Or, if preferred, an X-Y chart recorder may be used.

If you're looking for a way to speed up impedance measurements on antennas, filters, load resistors, transformers and other r-f networks, the Smith Chart Plotter is the essential tool. It's more accurate, too.

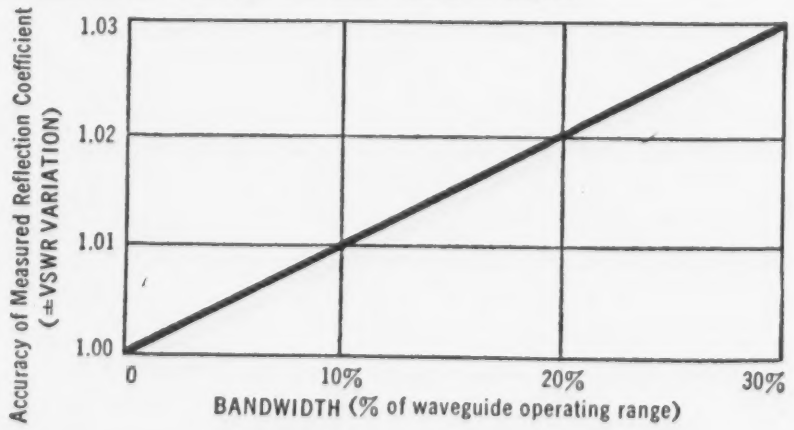
And there is more to come. For the measurement of r-f impedance in systems at any power level to the highest that can be generated, in either waveguide or coaxial line, other forms of the plotter will soon be available to supply a Smith Chart display. These will be particularly useful as system monitors.

SPECIFICATIONS

Nominal impedance . . . . . Z_o (Waveguide)
RF input voltage . . . . . 0.35 volts, rms
Oscilloscope signal voltage . . . 0.2 volts input required for full scale deflection on expanded Smith Chart (1.5 VSWR max) for DC oscilloscope having 1 centimeter/millivolt sensitivity
Accuracy of reflection coefficient measurement
see graph below
Sweep rate (maximum) . . . . . 60 sps
Spot rotation rate (maximum for full accuracy) . . . 1000 rev/sec
RF input-output terminals . . . . . Optional
Automatic level control terminals . . . . . BNC (where required*)

*ALC information supplied with unit.

For complete description, ask for Bulletin 60-3. You'll get the latest revision and supplement which include both waveguide and coaxial units.



Other areas of **DIELECTRIC** capability in coaxial, waveguide and open wire techniques . . .
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dial DIELECTRIC for solutions to communications problems.

DIELECTRIC PRODUCTS ENGINEERING CO., INC.
RAYMOND, MAINE

also the interests of the post service themselves, in keeping them both at equal dignities. Apparently there are ways of getting mail stamped earlier, through either system, and as far as the metered mail system is concerned, if you're interested in a discussion of that, I suggest it can be found in the September 1960 issue of the American Bar Association *Journal.*

Our present proposal is to rule out both the metered mail and the regular mail as far as late bids are concerned and to require either registered or certified mail before a bid that is late can be considered further for award.

We know well that even a department such as the Post Office, which through these many long years of faithful service to the public has inspired the motto, "Nor rain, nor sleet, nor snow, nor gloom of night shall stay these couriers from the swift completion of their appointed rounds," must depend for the completion of their everyday duties upon human beings, and, of course, all the frailties to which human beings are subject.

Here, the discussion was thrown open to questions from the audience.

Question: Mr. Gregg mentioned non-discrimination in unemployment in the Executive Order of the President and I'd like to ask Mr. Markey if the ASPR's are going to be revised to include this clause since, as Mr. Gregg stated, to place all of these things in all of your sub-contracts you can't very well spell everything out on every little purchase order. And it is very much easier to say the ASPR clause in effect at the date of the contract governs if applicable.

Another question to Mr. Markey is that in the total set aside to small business, what if only one small businessman bids? This has happened several times, as I recall and the regulation states that you should only do this if you have a reasonable expectation you will get enough competition and of course the contracting officer can withdraw it if small business agrees. Does this fall back into the normal formal advertising procedure where he should negotiate or resolicit?

Mr. Markey: On the first question I would say that certainly it will have to be amended to take care of the new non-discrimination clause. The President's Committee, appointed under the Executive Order, is working, I believe, rather diligently and coming up with regulations. The form that those regulations take, of course, will govern the manner of implementation of ASPR of the whole subject.

We have put forward an interim procedure for the clause that is distributed to all departments. I don't think it would be suitable for incorporation by reference at this time. We do hope that an early revision of the act will be able to do that if the businessman can.

On the second question, I would say that if judgment is made initially that there is more than one source and that is a proper judgment, the mere fact only one bidder does come in on a particular total set aside, and this of course can only be in the small business area, as you know, not in the labor surplus area, I would say that award could go forward on that basis.

Of course, if it were determined that in truth and in fact only one source existed then I don't think it would be proper to go to a total set aside situation.

Question: I'd like to ask George Markey the intent of the ASPR committee in revision 4 where they eliminated the large number of exceptions

to synopsizing proposed procurements. Was it your intention that unsolicited proposals submitted by contractors be synopsized before the contracting agency enters a contract? This is on unsolicited proposals, not responsive to a request for a proposal or an IFB?

Mr. Markey: No, I don't believe that was the intention at all.

Question: Well, it is not listed as one of the exceptions to the synopsizing and I understand this is the intention of the procuring activities now.

Mr.Markey: I hadn't been aware of that. We can look into it certainly.

Question: In the matter of developing hardware that is pushing the state of the art, what is the Government policy on giving similar contracts to two or more contractors and then deciding who has come closest or who has achieved something which reaches the spirit of the contract, rather than the Government losing out if the single contractor does not perform as promised or as hoped?

Mr.Wesselink: Well, I don't want to answer for the policy of all the departments. All I can say is there certainly have been occasions on which we have gone out and asked for proposals certainly in fields like I assume you are talking about for more than one proposer. We've done that; we did it recently through a prime contractor and asked him to go to roots in developing something in connection with one of our communications systems, as a matter of fact.

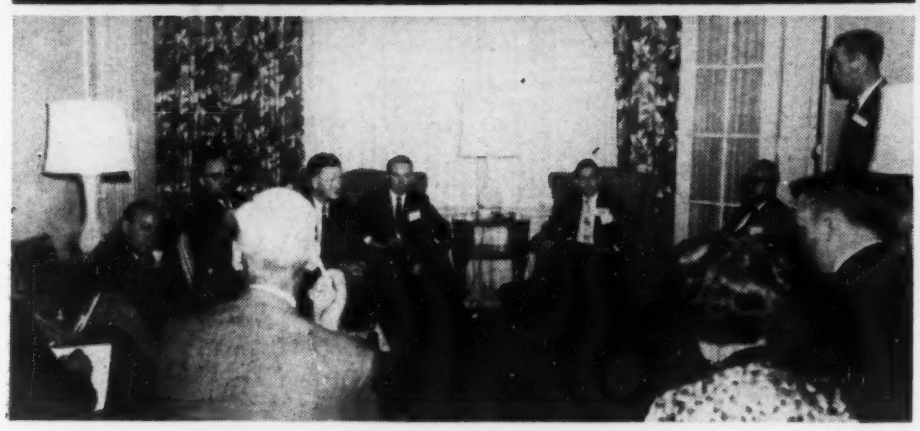
We asked him to go to two contractors and we finally got three people into it. Then the problem came up as to whom we should give the production contract. At that particular point we felt a little bit sad and unhappy because we had gone that route and we got into a hassle on our eventual decision as to whom to give it.

All I can say is I don't think there is any established policy that you will, in all cases, do so, but I certainly don't think there is any policy which says that under no circumstances would you do so. I think it depends upon individual situations and certainly, as far as the Air Force is concerned, there are occasions when we would go down two streets at the same time for the same item, especially in the development and research areas. I'm not at liberty to tell you the particular item that was involved, but if was in your field.

Question: I may have received the wrong impression, but I had the feeling in some of these presentations on discrimination in employment that the Government at the moment will have no hesitation in lowering the boom on contractors with respect to non-union employees, but they are not quite sure whether or not they should be real firm when it comes to enforcing these rules where union employees are involved. Would somebody comment on this?

Mr. Gregg: If I may answer that —and of course not being a member of the President's Committee I can't speak for them—but I don't believe at this point that anybody anywhere at any time has given any real indication that this would be so. Frankly, from our personal understanding at the Defense Department, this point does not enter into the situation whatsoever. And where we sit we're treating the situation alike in either case.

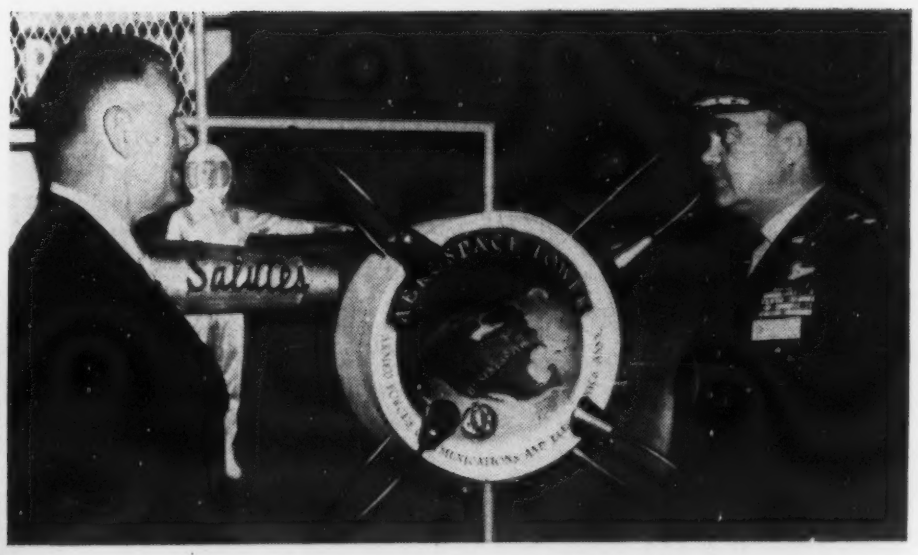
Panel Member: I might make just a further brief comment on that. Certainly in the Lockheed negotiation there was no indication that this was going to be the fact and I would say from the point of view of that particular negotiation the opposite would be true.



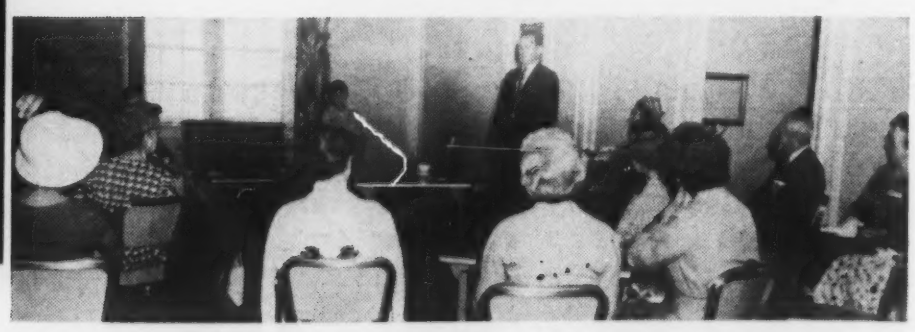
Members of the Press are shown above interviewing staff members of the General Telephone & Electronics Corp. Prior to the Press Conference, the four-man GT&E Panel had presented a discussion of New Frontiers in Reliable Communications. Specialists from GT&E Laboratories, Sylvania Electric Products, Inc., and Lenkurt Electric Co., Inc., discussed developmental, engineering and production techniques for assuring reliability in advanced communications systems.

Dr. George W. Bailey, Executive Secretary, The Institute of Radio Engineers (Left), receives the AFCEA Distinguished Service Award from Maj. Gen. Harry C. Ingles, USA (Ret.), Chief Signal Officer, 1943-47 and a Director, Radio Corporation of America. Benjamin H. Oliver, Jr. (seated) also received the AFCEA Distinguished Service Award.

Mr. Leroy R. Rosen, Program Manager, Data Processing & Display Systems Section, Bureau of Ships, wins a radio. Drawing Mr. Rosen's lucky card, from L to R, are Mrs. William Christopher, Miss Ruby Brothers and Bill Christopher of Sylvania. The radio was donated by Sylvania.



Major General Harold W. Grant, former Director of Telecommunications, USAF and presently Commander, Air Force Communications Service, presents a plaque to the Association. Benjamin Oliver, Immediate Past President, AFCEA, receives the award for the Association.



George N. Twigg, III, Raytheon Company, speaks before ladies attending the Convention about his trip behind the Iron Curtain. Other activities for the women were a luncheon and fashion show.

—INDUSTRY—

TWELVE COMPANIES have been invited to submit prime contractor proposals for the manned lunar Apollo spacecraft. The bids are to be submitted to the National Aeronautics and Space Administration's Space Task Group by Oct. 9, 1961. The companies who were invited to bid on the basis of demonstrated technical ability and interest in the Apollo system are Boeing Co., Douglas Aircraft Co., General Dynamics Corp., General Electric Co., Goodyear Aircraft Corp., Grumman Aircraft Engineering Corp., Chance Vought Corp., Lockheed Aircraft Corp., Martin Co., McDonnell Aircraft Corp., North American Aviation, Inc., and Republic Aviation Corp.

BENDIX CORP. will develop the long range missiles for the Navy's Typhon weapon system. When launched from guided missile cruisers, Typhon missiles are to be able to intercept both enemy aircraft and missiles at great ranges from primary fleet targets. The Applied Physics Laboratory of The Johns Hopkins University conducted preliminary design work for the missile and will have technical direction of its development.

SPACECRAFT EMERGENCY RECOVERY METHODS are being studied by Chance Vought Corp. under a $76,000 Air Force contract. The methods will provide for automatic or manual escape during every phase of the space vehicle operation, i.e., from prelaunch through completed flight. The program, sponsored by the Aeronautical Systems Div. of the Air Force Systems Command, calls for the development of a system which will provide a warning signal to the astronaut or ground controller for appropriate action, provided the emergency does not occur too fast for man's corrective reactions. If the emergency occurs too quickly, the system will initiate escape automatically.

SATELLITE TEST SYSTEM CONTRACT has been awarded to Radio Corporation of America by Lockheed Missile and Space Div. The contract calls for the construction and installation of an automatic programmer and test system for the monitoring and testing of satellites in an environmental chamber. Known as APATS, the RCA equipment initially will be used to check the Midas and Discoverer satellites. The satellites will be tested in a vacuum chamber that simulates outer space environmental conditions.

COMPUTER PROGRAMMING SYSTEM that is said to reduce the cost of and speed up the writing of business data processing programs has been completed and is being supplied to customers by Minneapolis Honeywell Regulator Co. The automatic programming aid, known as ARGUS (Automatic Routine Generating and Updating System), is designed to speed up the writing of data processing problems for the Honeywell 800 electronic computer. It is believed that the ARGUS can reduce the time and effort required to code and check out electronic data processing programs by enabling the Honeywell 800 itself to perform many clerical operations that on earlier machines were the responsibility of the manual programmer.

UNITED STATES UNDERSEAS CABLE CORP. will design, manufacture, and install a 700-mile extension to the existing underwater communications network serving the Atlantic Missile Range. The company will lay the new cable from Turks Island to Antigua via Ramey Air Force Base, Puerto Rico, a distance of approximately 717 miles. Joining the existing system at Grand Turk, the extension will come ashore at Ramey, where all of the derived channels will be available. The system will be capable of providing sixty 4 kilocycle channels in both directions. The $5 million project will be a joint venture of United States Underseas Cable Corp. and its principals, Phelps Dodge Corp., Northrop Corp., and Felten & Guilleaume of West Germany, with USUCC acting as over-all operations manager.

STUDY CONTRACT for a 4,000 watt solar power system suitable for use in earth orbiting satellites has been awarded to Westinghouse Electric Corp. by the Aeronautical Systems Div., Air Force Systems Command. Energy for the power system will be drawn from the sun and converted into electrical energy by use of solar cells. Then the electrical energy will be fed into the necessary electronic equipment to derive the required voltages and frequencies for operation of the satellite's communications equipment.

SUN-POWERED RADIO RECEIVER-PUBLIC ADDRESS SYSTEM for use in underdeveloped countries where electrical power is limited was demonstrated by Hoffman Electronics Corp. in Washington, D. C., recently. Called CLEAR (Community Listening, Educational and

Recreational), the system operates with the aid of silicon solar cells that convert sunlight into electrical energy. The system includes a radio receiver, loudspeaker, silicon solar cells to generate electricity and a battery to store the power for operation at night. A microphone plugged into the radio automatically interrupts radio reception and converts the unit into a public address system.

RCA, ASTRO-ELECTRONICS DIV. will provide payload capsules for use in testing electric propulsion engines, the National Aeronautics and Space Administration reports. RCA will design, fabricate and test seven capsules, three for ground tests and four for flight tests. Each capsule will carry two electric engines. The first test capsule is scheduled to be launched by a Scout rocket during the last quarter of 1962.

—GENERAL—

SECOND SOVIET COSMONAUT, Gherman Titov circled the earth seventeen times in a twenty-five hour orbital flight, the longest journey into space yet made by man, on Aug. 6, 1961. Major Titov circled the earth every 88.6 minutes in a path that carried him to a maximum altitude of 160 miles above the earth and a minimum of 110 miles. The 26-year-old air force officer sent messages to various countries as his five-ton space ship passed over them. His message to the American people was recorded by an Arlington, Va., ham operator, M/Sgt. James A. Duffy. The message, as interpreted by the Soviet Embassy in Washington, D. C., conveyed greetings to the "people of North America from the Soviet space ship Vostok II." Duffy, a 45-year-old Army communications specialist, taped Titov's remarks as he passed over the Washington, D. C. area.

ATT FILES DAMAGE SUIT, seeking to collect more than $2,750,000 for the sabotage of three long distance communication stations. The suit, filed in the Second Judicial Court in Reno, Nev., on July 12, 1961 named Bernard Jerome Brous, Dale Christian Jensen, and a number of individuals who were unidentified at that time. Brous and Jensen were indicted earlier by a Federal grand jury for violation of the Federal sabotage law. The sabotage occurred May 28, 1961, when two microwave relay stations at Cedar Mountain, Utah, and Wendover, Nev., and one cable repeater station at Knolls, Utah, were blown up with high explosives. The blasts knocked out more than 2,000 telephone circuits, many of which carried defense communications and other critical services.

CONFERENCE ON TECHNICAL-SCIENTIFIC COMMUNICATIONS will investigate government and non-government research and development communications. Sponsored by the Institute of Radio Engineers, the conference will be held in Philadelphia on Sept. 14-15. Speakers will be representatives from government, industry and the technical press.

TELEMETRY UNIT TWICE RECOVERED FROM SPACE may be used in future satellite experiments. The unit was included in the Discoverer XXV space capsule which was recovered from sea last June. Previously, the telemetry set had been placed in the Discoverer XVIII payload which was snatched from the air by plane in December 1960. According to satellite engineers at Lockheed Missiles & Space Co., the undamaged telemetry set probably will be sent up again in a future Agena-B vehicle.

NIGERIAN INTERNATIONAL TRADE FAIR will be held from Oct. 27, 1962 to Nov. 18, 1962. Closing date for applications for display space is Oct. 1, 1961, and the applications should be sent to the Federal Ministry of Commerce and Industry. The purpose of the trade fair is to provide a market for the products of both the developing countries of Africa and those of developed countries wishing to sell to them.

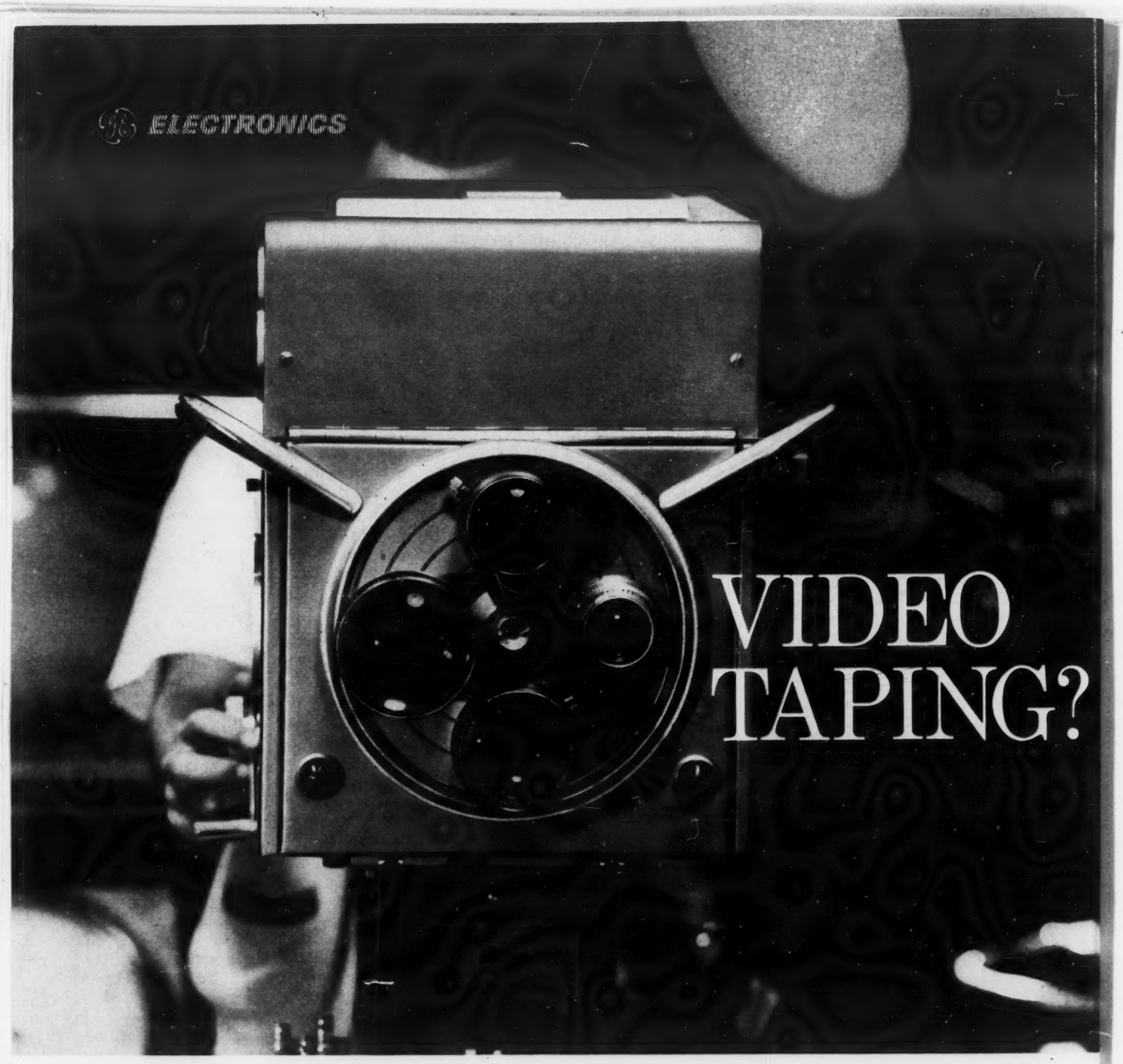
CALENDAR OF EVENTS:

SEPT. 6-8: Annual Meeting of the Association of the U. S. Army, Sheraton-Park Hotel, Washington, D. C.

SEPT. 14-15: Joint Engineering Management Conference, sponsored by American Society of Mechanical Engineers, American Institute of Electrical Engineers, American Society of Civil Engineers and American Institute of Industrial Engineers, Hotel Roosevelt, New York City.

SEPT. 17-30: Transportation and Logistics Forum, sponsored by National Defense Transportation Association, Denver Hilton Hotel, Denver.

SEPT. 20-21: Joint Industrial Electronics Symposium, sponsored by Institute of Radio Engineers, American Institute of Electrical Engineers and Instrument Society of America, Bradford Hotel, Boston.



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GL-8093/ZL-7803—3-inch image orthicon specifically designed with video taping in mind. *This one has it!* High signal-to-noise ratio (peak-to-peak signal vs. [RMS] noise—min.: 38, av.: 50) and improved definition you need for critical video tape recording. Yet, it is competitively priced with standard camera tubes. Key to its high signal-to-noise ratio is an improved target-mesh assembly in the scanning section which improves your picture quality . . . provides sharp transition from black to white without white edges. This also improves flatness of field and corner resolution—helps prevent distortion.

The GL-8093 is especially recommended for critical video tape recording work, such as found in network centers and tape production centers. Its good definition and improved signal-to-noise ratio are important features where numerous copies are made from an original tape, as in many educational programs, and for those productions where you can't settle for less than top quality.

The GL-8093 will save you set-up time—reduce the need for compromise between sharpest focus and minimum background blemishes. It is interchangeable with the 5820, 5820A, 7293, 7293A and 7513. Try this new G-E image orthicon in your own cameras. You'll like the difference it makes in your video tape recording work.

For more information, call your General Electric tube distributor or write for descriptive literature, ETR-2801, to General Electric Company, Room 7246C, Owensboro, Ky.

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Progress Is Our Most Important Product

GENERAL ELECTRIC

LIMITED WAR COMMUNICATIONS SYSTEM

by LIEUTENANT COLONEL GEORGE W. SLY
Chief, Army Wide and Local Projects Section
Communications Facilities Branch
Army Communications Systems Division
Office of the Chief Signal Officer

The following remarks were made by Ben Adler, President, Adler Electronics, Inc., at a press conference and demonstration of the AN/TSC-18, 19 and 20 held at the Pentagon. Mr. Adler suggests ways the Government-Industry team can meet today's military needs.

A BASIC FORMULA for meeting limited war and other defense requirements can be derived from the TSC series achievement. This formula involves two major factors. One is "time" and the other, "usable hardware." All Government-Industry effort must be geared toward translating military requirements into reliable, usable hardware within minimum time periods.

First there must be a spirit of cooperation between Department of Defense agencies and responsible contractors. Planned programs should be established to guide this spirit into productive channels. They would require that industry be brought into the military planning picture when ideas are in their germinal stage. This will not only provide the benefit of wider technical experience, but will substantially shorten the time required to complete a project after the award of a contract.

I am certain that many firms with proven skills and capabilities are interested in taking part in such programs. They must remember, however, that membership in this team entails exacting obligations. These are a willingness to tailor their capabilities—including people, plant and know-how—to the needs of each program. Programs must be pursued aggressively until reliable hardware that fits into the required system is produced or found on a supplier's shelf. Furthermore, contractors must follow hardware into the field and play an immediate and effective part in evaluation and improvement programs. Through all phases of development, design and production, continuous attention must be paid to the role of each piece of hardware, each sub-system, and each system in overall military strategy.

Industry also should initiate research and development efforts in areas still uncharted by organized programs, by anticipating and interpreting strategic and tactical requirements.

Just as industry assumes certain obligations to meet urgent defense needs, Government agencies must do likewise. They must provide a full and free flow of information through every stage of a program—from concept to field operation. And they must provide effective, decision-making apparatus for close liaison with industry team members.

FROM THE STANDPOINT of military communications at least, the Cold War has produced a list of potential battlefields that are curiously remote and, until now, virtually inaccessible through regular communications facilities. The jungles of Laos, jungles and deserts on the African Continent, the mountain wastes of Tibet—none could be said to be "wired for sound."

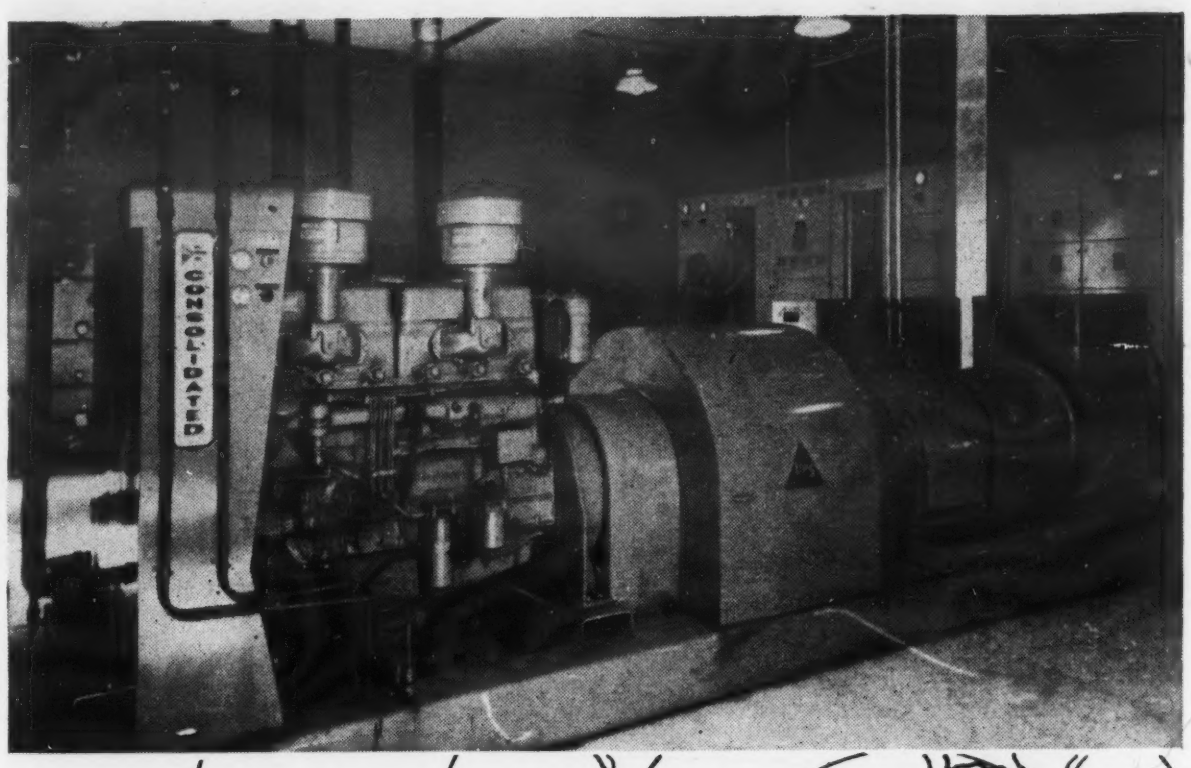
Yet today's Army must maintain its combat ready posture, and must be ready to deal with any eventuality in any part of the globe, however remote. To insure its ability to meet its obligations, the Army must have a reliable, compact, long-range, air-transportable communication system which will form a link even from areas with no regular communications facilities to the Army's globe-circling STARCOM network.

This capability is now possible with a new family of long-range communications systems recently delivered to the Signal Corps by Adler Electronics, Inc. and demonstrated on June 1 through 7 at Fort Myer, Virginia. Working with the Signal Corps, the company has developed and built three systems, the AN/TSC-18, AN/TSC-19, and AN/TSC-20.

With a maximum range of 7,000 miles, the new family of systems can not only provide a theatre commander with service in an area where no ordinary facilities exist, or where existing communications have been disrupted, but can by-pass one or more STARCOM stations to communicate directly with the Pentagon.

The AN/TSC-18, with a range of 7,000 miles is the world's most powerful transportable cummunications central. It provides simultaneous transmission over three telephone and 16 teletypewriter channels. The 5,000-mile range of the TSC-19 also has three telephone and 16 teletype channels. Both of these systems can tie-in to the STARCOM net from any point on the globe.

The TSC-20 is the medium range member of the family. It has one voice and four teletype channels and a range of 2,500 miles. This system



is light enough to be transported by helicopter into inaccessible areas. The other two systems have been designed for transport by C-124's, and the smallest system is normally transported in a C-119.

The complete communications central package in each case can be airlifted to any trouble spot on a moment's notice, and once there, can be set up in less than four hours. Each system has enough spare parts for three months' operation.

The TSC-18, -19, and -20 operate on 40 kw, 10 kw and 1 kw twin sideband transmitters respectively. The TSC-18 is housed in one van and three shelters, the TSC-19 in four shelters, and the TSC-20 in a single shelter. All are completely self-contained and stored in the van and shelters during transport by air. Proper operating conditions for the equipment are provided for through built-in heating, ventilating and air conditioning in the van and shelters.

The Army feels that the new communications centrals have sufficiently advanced capabilities to meet Army needs in this area until 1965 or after.

Speaking of the systems, Col. W. D. Joslin, Chief of the Army Communications System Division, Office of the Chief Signal Officer, said at the demonstration of the equipment, "In view of the combat capability for global warfare possessed by the United States and any opposing force it is more likely that any future aggression would initially at least involve warfare limited in nature . . . .

"Command control in any limited warfare operation that may at any time assume global proportions makes it essential that communication be maintained between the combat zone and combat support elements, and with headquarters here in Washington. The factor of time is critical and the potential areas of disturbance are frequently those where no regular or dependable communications facilities exist."

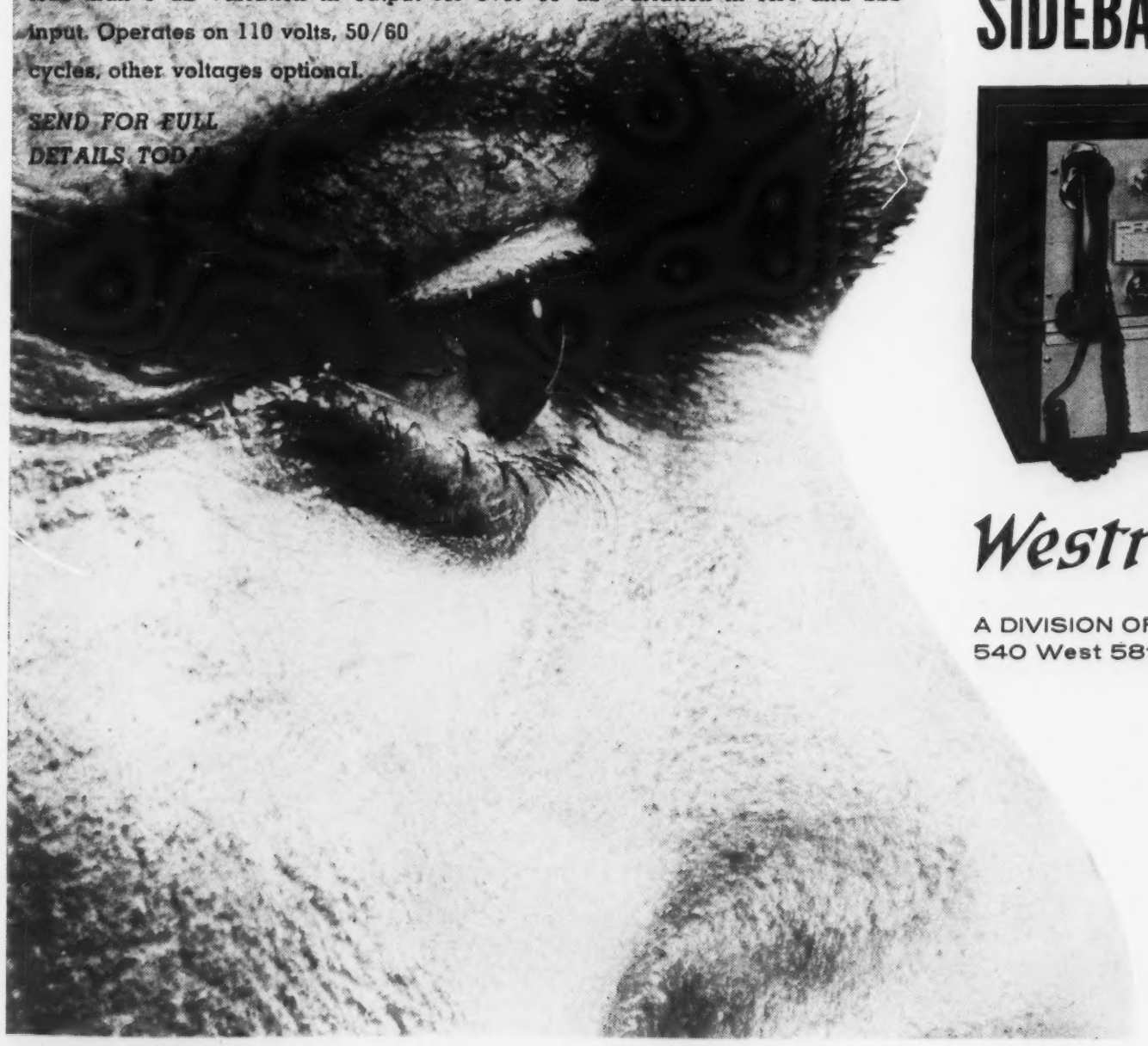
Referring to the new communication centrals, Col. Joslin continued, "The Army now has, in these, a communications and command control capability for any type of limited warfare situation conceivable—any time, any place, any war. These represent a truly significant contribution to the effectiveness of our troops in combat."

Delivery of the first of the new systems for field testing has already been accomplished. It is expected that the system will be used by Army units throughout the world.

265,000-HOUR OBSESSION

Give or take a few hours, 265,000 hours amounts to about 30 years. That's the length of time Westrex, one of the pioneers in high frequency single-sideband systems, has been concentrating on the development and manufacture of communications equipment. The new Westrex Type 9B HF SSB Transmitter-Receiver is the latest result of our single-minded effort to design a low-cost, medium-range unit that can be relied upon for sound, uniform operation. We think the Type 9B is perfect for a variety of fixed or transportable applications. A few are: Civil defense. Government and commercial forestry services. Off-shore petroleum operations. Geophysical research activities. The four-channel Type 9B covers the 2-to-15 mc range and offers a choice of SSB (upper or lower), AM, and CW. A compact 19" wide, 8¾" high, and 15" deep, the set is equipped with a built-in tuneup meter, noise-cancelling handset, and voice-operated VOX circuit. Three 6146 power output amplifiers insure linearity and reliability. Readily operated by non-technical personnel. Other features of the Type 9B are: Power output 100 watts PEP, 100 watts CW, 25 watts AM. Frequency stability ±5 parts in 10^8 with standard oven, ±1 part in 10^8 with high stability oven. Third order non-linear distortion better than 36 db. Receiver sensitivity better than 0.4 microvolt. AGC characteristic less than 3 db variation in output for over 80 db variation in AM and SSB input. Operates on 110 volts, 50/60 cycles, other voltages optional.

SEND FOR FULL DETAILS TODA



RESULT:

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SIGNAL interviews Brig. Gen. B. H. Pochyla on the purpose and results of the First Military Creative Problem-Solving Seminar

Last spring, the U. S. Army Management School, Fort Belvoir, Virginia, sponsored a three-day Military Creative Problem-Solving Seminar for selected officers and civilians of the three military services. Objectives of the Seminar were: To enhance individual creative ability; To acquire a facility in teaching others to be more creative; Provide an opportunity to learn the use of proven techniques for maximum production of ideas and for processing tentative ideas into useable ideas, and to develop skill in organizing and conducting creative problem-solving activities; Acquaint officers with the latest developments in creative problem-solving, including research conducted at the University of Buffalo and other major centers of creativity research; and Provide opportunity for officers to discuss application of creative procedures with each other and with recognized authorities.

In the following article, SIGNAL *presents an interview with one of the officers who attended this Seminar. Brigadier General Benjamin H. Pochyla, former Commanding General, U. S. Army Signal Training Center, Fort Gordon, Georgia, and recently assigned Deputy Director, J-6 (Communications-Electronics), Joint Chiefs of Staff, believes the principles and techniques of problem-solving that were presented at this Seminar can be used to a great advantage in solving military problems. He believes this to be particularly so in the communications-electronics field, including the training of military technicians. For this reason he introduced some of these creative problem-solving techniques to his Command at Fort Gordon before his departure. In this interview General Pochyla explains the purpose and results of this important first Military Creative Problem-Solving Seminar.*

The Editor

Q. General Pochyla, we understand that you attended the first Military Creative Problem-Solving Seminar held at Fort Belvoir recently. What was the purpose of this seminar?

A. Yes, I had the privilege of attending this seminar which was sponsored by the U. S. Army Management School and was presented by the Creative Education Foundation of Buffalo, N. Y. As to its purpose, the Army wanted to acquaint top military and civilian leaders of all branches with the latest techniques in problem solving, and to determine if such seminars would fit into the Army Education Program. Most of us are aware that few individuals produce at their full mental capacity. Often we will get into a rut in our thinking, and you know what a rut is—it's a "grave with both ends knocked out!" By properly challenging our mental capabilities, we can come up with better solutions to both current and future problems.

Q. Isn't this quest for creative thinking somewhat the opposite of military discipline?

A. Not at all. Many of our technical advances, particularly in the field of communications-electronics, have depended on some individual or group of individuals displaying creative thinking. The Signal Corps always welcomes evidence of this type of approach to problem-solving. We must provide a management atmosphere that welcomes ideas of all sorts and then expose them to sound and constructive criticism. The seminar idea also fits in perfectly with the Army's suggestion and incentive awards program, which is now being emphasized by the Chief of Staff.

Q. What can the Signal Corps do to increase its potential in this respect?

A. For one thing, we must be willing to accept or give serious consideration to new solutions to old problems when our subordinates advance them, rather than sticking blindly to the old "tried and true" methods. We must allow our subordinates more latitude in their approach to problem-solving, and certainly we must be willing to continue this program despite occasional errors which will show up from time to time. The price of delegation of authority is the acceptance that mistakes may occur. We must be concerned with quantity of ideas as well as quality in that quantity almost always assures rare and unusual solutions. We must discard the old philosophy of being critical of new approaches to avoid error. Every manager should be willing to carry a margin of risk and expect some errors.

Q. How could a program such as this help your training mission at the Signal Training Center?

A. There are many fields in which this creative approach could be utilized. For example, we are studying the application of automated or machine teaching to our highly specialized technical training. Much study and research has already been accomplished in this technique, but improved teaching methods continue to be a field for pioneer and creative effort. Only by using a creative approach to our many activities can we achieve the optimum accomplishment of our over-all objective to teach more and more communications specialists, faster and better with less overhead.

Q. Then you feel that by adopting this creative approach, you will be able to shorten training time and increase its effectiveness?

A. Yes, I do. I believe it will help us to compress our time frame in the field of communications instruction, and this we must do if we are to accommodate the steady increase in communications personnel requirements and still obtain useful service from our graduates while they are on active duty.

Q. How significant has this increase in communications personnel been?

A. In 1956, only 6 per cent of all Army personnel required communications-electronic training. Today, over 18 per cent must have that background to perform their

General and Flag Officer's Group of the seminar. Gen. Pochyla is at left, in foreground.

jobs. Thus our teaching load has tripled while the number of our instructor personnel has not kept pace.

Q. Getting back to creative thinking and problem solving, General Pochyla, is there any pattern to this approach?

A. Yes, there is. The Creative Education Foundation has divided the problem-solving process into nine steps: Observation, Definition, Preparation, Analysis, Ideation, Incubation, Synthesis, Evaluation and Development.

Q. Most of these terms are familiar; however, could you explain a bit more about ideation and incubation?

A. Ideation is merely piling up alternatives to the solution of problems by way of ideas. Putting it another way, it's the process of generating uninhibited ideas (either by a group or on a solo basis) without any attempt to judge or evaluate these raw ideas. This step, sometimes referred to as "brainstorming," is followed by a process that calls for little or no conscious effort which is known as incubation. It covers the phenomenon by which ideas spontaneously well up into our consciousness. It invites "illumination" and often results in "bright" ideas.

Q. Did the seminar cover this matter of "brainstorming," and what are your thoughts of this technique as an approach for creative thinking?

A. Yes, it did. It is my impression that the seminar conferees came away convinced that the brainstorming session, where any and all ideas are recorded with judgment and criticism suspended until a later screening or evaluation session, was extremely productive. In this procedure, all ideas, the wilder the better, are welcome, since the most impractical suggestion may trigger a more logical solution from another panelist. Quantity is important, since quantity gives a broader spectrum for critical consideration and it is easier to trim a long list than fatten up a short one.

Q. Will you depend upon any particular group of individuals in your command to come up with these creative suggestions and solutions for your training problems?

A. Everyone in my command is encouraged to think creatively and to submit suggestions on how we can improve our operations and save time, money and manhours of labor. It is interesting to note what a tremendous reservoir of potential creativity exists all around us in the minds of fellow officers and associates, both military and civilian. I feel that many solutions to our problems are reposing dormant in the minds of our employees, and it is up to us to awaken these ideas and provide the opportunity to bring them out into the open.

Q. Then you feel that the seminar at the U. S. Army Management School was a success and that such seminars should be repeated?

A. Yes, I certainly do. If we are to continue to progress in this rapidly changing world, and compete successfully with our adversaries, the Army and the military, as a whole, will have to place more emphasis on creative thinking. We need to produce new approaches and truly unique innovations for the problems that have been irking all military leaders for a long time. Creative problem solving is a technique that we can all use and from which there should be many tangible benefits. We must get the utmost from all the brain power we have available and really put our worthwhile ideas to work.

EQUIPMENT RELIABILITY AT BRITISH AIR SHOW

SIGNAL Staff Report

BRITISH DEVELOPMENTS of ultra-reliable equipment are being featured at the Farnborough Air Display and Exhibition being held in London this month. Increased operating speeds and traffic density in the airways have necessitated a greater reliability in electronics equipment to be used in aircraft and at ground control centers. This is the belief of the British Electronic Engineering Association whose member companies are showing recently developed devices which are intended to increase air safety.

Transistorized radar equipment which has undergone more than 10,000 hours of prototype trials and achieved 99.8 per cent reliability is being exhibited by Decca Radar. The equipment is part of a radar display system. The reliability figure for the equipment is made possible by a system known as "environment stabilization" in which all the components and circuits are held at a constant internal temperature, accurate to within a quarter of a degree Centigrade and at a controlled humidity.

Laboratory tests have shown that outside temperature variations between freezing point and 45 degrees Centigrade, together with humidity changes ranging from 10 per cent to 90 per cent, can be dealt with by the environment stabilization equipment. In fact, whatever the outside climatic conditions, the equipment continues to work at its predetermined temperature and humidity.

Marconi's Wireless Telegraph Company has used a method of sealing off components to increase their reliability. Whenever possible, circuit sections for radio and navigational apparatus are encapsulated in a dry, inert gas in order to protect them from damage by dust and atmospheric changes. Transistorized circuits for this series underwent 30,000 hours of testing to ensure reliability.

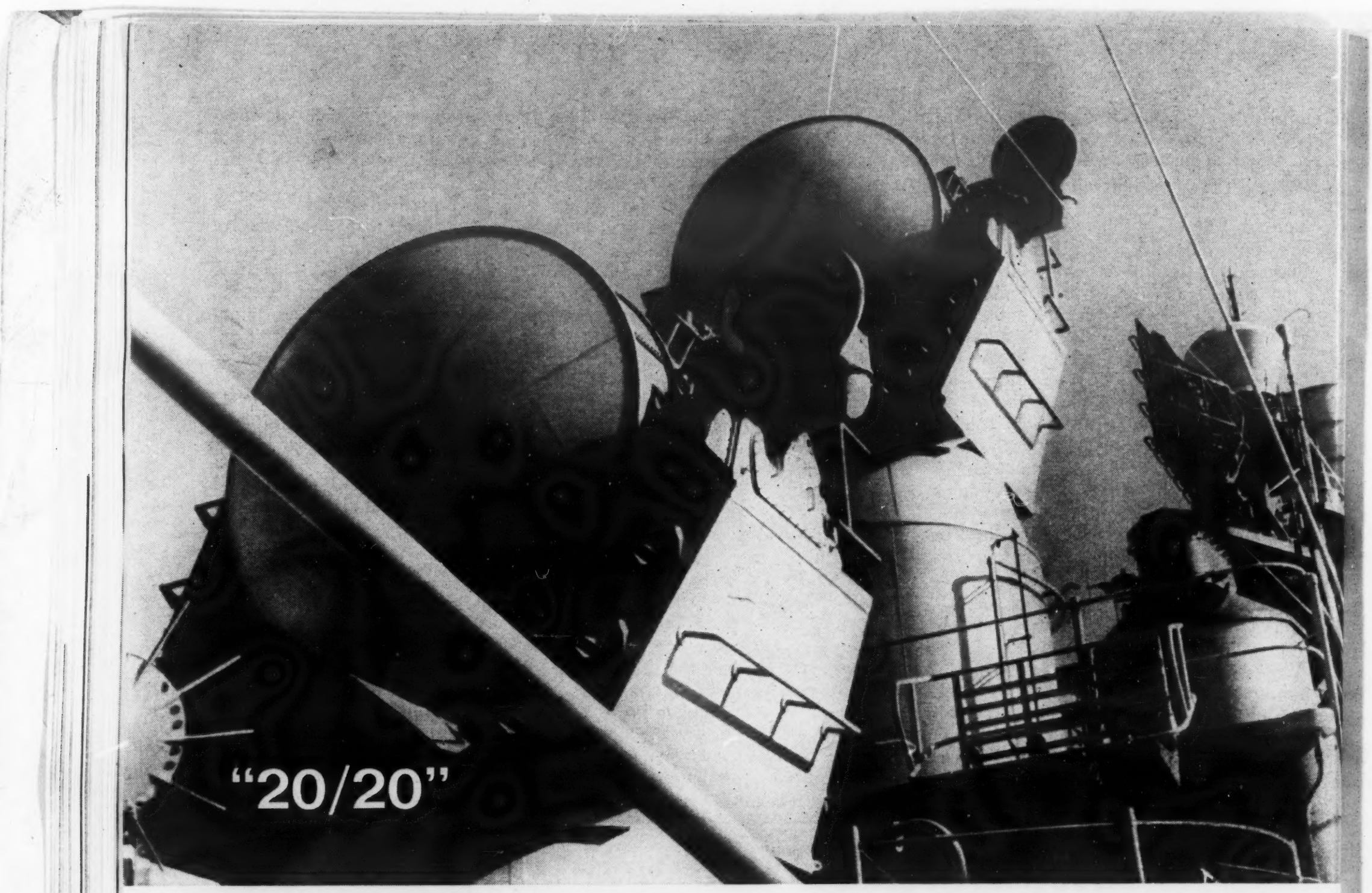
Marconi's Wireless is showing what they claim to be a world's first in radar presentation. It is a compact unit which presents radar information but also accepts synthetic displays such as maps of the terrain, aircraft identification, range rings and also information fed in from manual or automatic direction finders.

In this display the methods of writing information is similar to that employed in normal handwriting, the pen being the electron beam. It gives extremely clear presentation and each character is written in only 20 millionths of a second so that several identification characters can be associated with each aircraft plot.

Air traffic control becomes so complex with increasing density that, to achieve adequate safety factors, it is planned to introduce automatic systems on the ground and in the air. Elliott Brothers is demonstrating how a general purpose digital computer, the type 803, can be programmed to carry out a wide range of control functions. The computer demonstrates air traffic control procedures, including the filing of flight plans. The equipment also is being used to control an automatic telegraph switching center for a closed communications network.

Secondary surveillance radar, a method of instantly identifying radar plots, is the principal display by Cossar Radar and Electronics. The system successfully completed acceptance tests by the Ministry of Aviation at London Airport several weeks ago.

The Cossar equipment consists of an interrogator-transmitter on the ground which triggers off a transponder in the aircraft. The transponder is capable of sending back any one of 64 different reply codes which will identify the radar plot appearing on the controller's screen. The system makes it unnecessary for aircraft to carry out special maneuvers to identify themselves.



For Navy's surface-to-air *Terrier* missile, the SPG-55 Missile Guidance Radar by Sperry – shown above on the new missile frigate USS Dahlgren–provides "20/20" target acquisition and tracking, together with precision guidance of missile to target.

Other radars by Sperry range from a portable field unit for detecting enemy vehicle and personnel movements in combat, to a network of giant area defense "fortress" radars on 24-hour air search duty continent-wide. Tracking, guidance, navigation, weather, tactical search, area defense–advanced Sperry radars are on duty in these and many other areas of commerce and defense–in-action evidence of one of the widest-ranging radar capabilities available today. General offices: Great Neck, N. Y.

Typical examples of Sperry radars are (l. to r.): USMC's airliftable tactical early warning radar, TPS-34; diminutive Army PPS-4 battlefield surveillance radar; Air Force APN-59 air navigation radar; commercial Radar 5 for small craft navigation: FPS-35 for USAF's Continental Aircraft Control and Warning System.

SPERRY

Activation Ceremonies at the VLF Station in Cutler, Maine

Signal Staff Report

W. L. Freseman, Assistant to the President, Radio Engineering Laboratories, Inc., who represented AFCEA at the ceremonies, congratulates Admiral Virden upon the successful completion and commissioning by the Navy of the VLF station. On the left is Commander J. J. Zammit, USN, the Commanding Officer of the Naval Radio Station, Cutler. The plaque held by Admiral Virden was presented to him by Commander Zammit in commemoration of the commissioning.

On June 23, 1961, Rear Admiral Frank Virden, USN, Director of Naval Communications, was the principal speaker at the dedication of the Naval Radio Station Cutler, VLF Maine. Admiral Virden in tracing the historic Naval radio developments stated that the first Naval Very Low Frequency station was located at Arlington, Virginia. Radio Arlington's call letters were NAA. Admiral Virden said, "It is only appropriate that this important station (VLF Maine), which is the most celebrated new member of the Naval Communication System, be appropriately assigned the call letters, NAA, to perpetuate here in Maine the call letters made famous by the Navy's Radio Arlington."

Admiral Virden explained that from Naval tests made in 1918, it was learned that Very Low Frequency radio signals could be received aboard fully submerged submarines. "VLF Maine does not transmit only to submarines, but it can be heard better and farther on the surface of the earth. In communications satellites compatibly equipped, VLF Maine can be heard beyond the ionosphere." He concluded his speech by saying that this new, most powerful radio station is an integral part of the whole Naval Radio Communications program.

Cutler is located approximately 60 miles south of Eastport, Maine, the most northeasterly point in the United States. The station site is comprised of about 3,000 acres, of which 2,850 are devoted to the Very Low Frequency transmitter and antenna site, and about 150 acres to the high frequency and administrative areas.

VLF Maine's transmitter power is 2,000,000 watts, forty or more times the power output of the most powerful broadcast transmitter previously authorized. Its transmitter frequency range is 14 kilocycles (21,400 meters) to 30 kilocycles (10,000 meters). The antenna system is composed of 26 towers in two separate arrays. Each array consists of a central tower 980 feet high, six intermediate towers 875 feet high, and six outer towers 800 feet high. Each antenna array measures 6,200 feet from apex to apex, and covers about 357 acres. The ground mat consists of approximately 1,000,000 pounds of copper wire, buried at an average depth of about 12 feet. The tower and guy foundations required approximately 35,000 cubic yards of concrete. The station power generating capacity totals 13,000 KW. The towers required about 12,000 tons structural steel. The estimated fuel usage is 3,000,000 gallons Navy Special (black oil) annually.

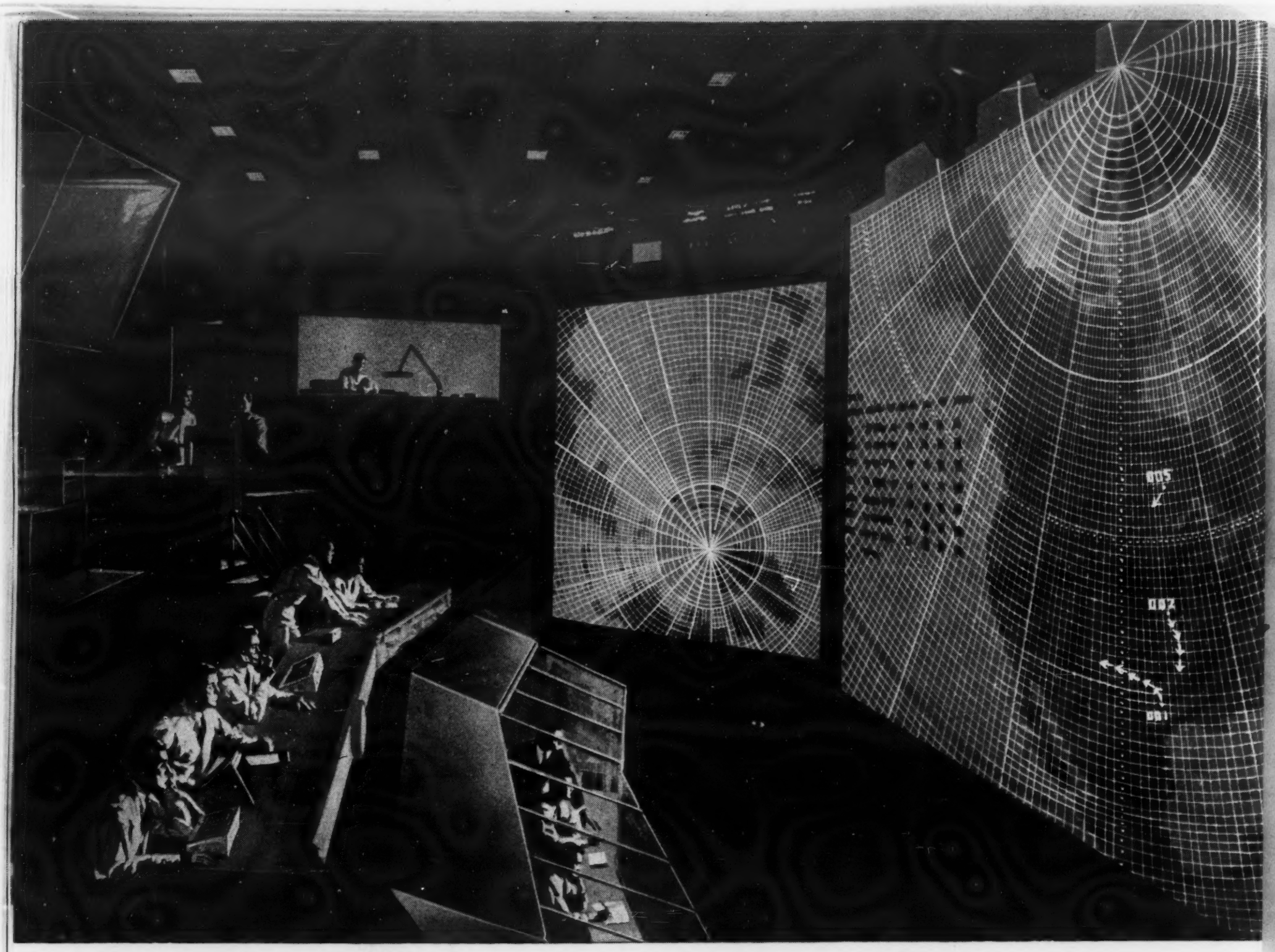
The prime contractor for transmitter manufacture, antenna and power plant design, and for construction at the site was Continental Electronics Manufacturing Company of Dallas, Texas, a subsidiary of Ling-Temco Electronics, Inc.

The project begun on January 13, 1958, was completed one full year ahead of schedule, a major engineering feat accomplished by the Navy's Civil Engineering Corps and civilian contractors. The initial greeting was beamed January 4, 1961.

Under the supervision of the Navy's Bureau of Ships and Bureau of Yards and Docks, some sixty government contracts with various firms were required for completion of the VLF Cutler station.

Commander Joseph John Zammit assumed command of the Radio Station in Cutler on February 1, 1960. Previous to this assignment, Commander Zammit was Branch Assistant, Head of the Naval Communication Shore System, while serving in the Office of the Chief of Naval Operations.

Captain J. Richard Burke, CEC, USN, was Resident Officer in Charge of Construction, while Captain Thomas J. White, CEC, USN, District Public Works Officer, for the First Naval District, Boston, supervised the entire Cutler construction project.



NORAD ON THE ALERT

Inputs from BMEWS Provide Instantaneous Missile Data Direct to NORAD Headquarters

From our vast outer defense perimeter, over thousands of miles, to the nerve center of the North American Air Defense Command at Colorado Springs, the most advanced concept of data handling and checkout is being utilized in the BMEWS system. The stakes are high, for the purpose is defense of the North American Continent.

At BMEWS installations operated by USAF Air Defense Command, computers read out missile tracking data from giant radars. This information is simultaneously relayed to NORAD's Combat Operations Center.

The Radio Corporation of America is prime systems contractor for BMEWS. At the COC, RCA's Display Information Processor computing equipment automatically evaluates missile sightings, launch sites and target areas. By means of data processing and projection equipment installed by RCA and a team of other electronics manufacturers, the findings are displayed on huge, two-story high map-screens in coded color symbols, providing the NORAD battle staff with an electronic panorama of the North American and Eurasian land masses.

The handling of BMEWS inputs at NORAD is an example of how RCA data processing capabilities are assuring the high degree of reliability so vital to continental defense.

Out of the defense needs of today a new generation of RCA electronic data processing equipments has been born. For tomorrow's needs RCA offers one of the nation's foremost capabilities in research, design, development and production of data processing equipment for space and missile projects. For information on these and other new RCA scientific developments, write Dept. 434, Defense Electronic Products, Radio Corporation of America, Camden, N. J.

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- outstanding panel presentations in communications and electronics (Requests by industry to present panels have exceeded our quota. The selections will be announced in the next issue.)
- 4 social events including the Buffet and Gilbarte Floor Show and the Association's Annual Banquet
- industry brings its products to the doorstep of defense
- mark your calendar now

16th AFCEA Convention • Washington, D. C.

AFCS Activation Ceremonies

SIGNAL Staff Report

Mr. Frank A. Gunther (left), AFCEA President, and Col. W. J. Baird (center), AFCEA General Manager and SIGNAL Editor, present Maj. Gen. Harold W. Grant with a special citation in recognition of General Grant's selection as the first Commander of the Air Force Communications Service.

AMID THE GATHERING of VIP's and in an atmosphere of a truly well organized and timed to the second ceremony, the Air Force Communications Service was activated on 1 July 1961. Congratulatory messages from military and industry leaders throughout the country poured in before and during the impressive ceremony.

Frank A. Gunther, AFCEA National President and W. J. Baird, AFCEA General Manager and SIGNAL Editor presented a special citation to Major General Harold W. Grant, commander of the AFCS. The citation read: "The Armed Forces Communications and Electronics Association recognizes the significance of this important event which is taking place today. While the official record will record 1 July 1961 as the day of activation of a new major Air Force Command, the unofficial record will indicate more precisely the feelings and profound admiration and respect in which you are held by the National Officers and Directors and the entire membership of our Association.

"We are proud that the United States Air Force has selected you to head a communications service which will mean a great deal to our future national welfare. Your selection as the Commanding General of the Air Force Communications Service is outstandingly striking since this privileged honor has been given to a man of unquestionable ability, high integrity, profound devotion to duty and extraordinary executive and command leadership.

"We wish you well and extend you our warm congratulations. We do so, General Grant, with a feeling of great pride and with a deep appreciation for the way you, as an outstanding Vice President of the Association, have steadfastly supported the industry-military team concepts of the Armed Forces Communications and Electronics Association."

At the opening of the ceremonies, General Curtis LeMay, Air Force Chief of Staff, telephoned General Grant from his office in the Pentagon and stated that both he and General Thomas D. White, retired Chief of Staff, felt a deep personal interest in the new command. Citing its importance, General LeMay pointed out that the formation of the new command was in keeping with the desires of President Kennedy, who recently emphasized the requirement for improved command and control of our forces.

Messages of congratulation were received by General Grant from Air Force commanders all over the world. More than 200 separate AFCS units in 35 countries and 46 of the fifty states flashed reports to their new commander, as the new organization absorbed what had formerly been known as the Airways and Air Communications Service.

Among the representatives of the communications industry who sent greetings to the sixteenth major Air Force command were Harold S. Geneen, President of International Telephone and Telegraph Corporation; Frederick R. Kappel, President of American Telephone and Telegraph Company; Walter P. Marshall, President of Western Union and David Sarnoff, Chairman of the Board of Radio Corporation of America.

Maj. Gen. Harold W. Grant (left), AFCS Commander and Maj. Gen. Donald P. Graul, AFCS Deputy Commander, are shown with the new Air Force Communications Service flag.

AFCEA Sustaining and Group Members

Communications—Electronics—Photography

Listed below are the firms who are sustaining and group members of the Armed Forces Communications and Electronics Association. By their membership they indicate their readiness for their share in industry's part in national security. Each firm nominates several of its key employees or officials for individual membership in AFCEA, thus forming a group of the highest trained men in the electronics and photographic fields, available for advice and assistance to the armed services on research, development, manufacturing, procurement, and operation.

Sustaining Members

American Telephone & Telegraph Co., Long Lines Department
General Electric Co., Defense Electronics Div.
International Telephone & Telegraph Corp.
New York Telephone Co.
Radio Corporation of America
Western Electric Co., Inc.

Group Members

Adler Electronics, Inc.
Admiral Corp.
Allied Control Co., Inc.
Allied Radio Corp.
American Cable & Radio Corp.
American Institute of Electrical Engineers
American Machine & Foundry Co.
American Radio Relay League, The
American Telephone & Telegraph Co.
Amphenol/Borg Electronics Corp.
Andrew Corp.
Ansco Division, General Aniline & Film Corp.
Arnold Engineering Co., The
Associated Electrical Industries Ltd.
Automatic Electric Co.
Automatic Electric Sales Corp.
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Autonetics, Division of North American Aviation, Inc.
Bell Telephone Company of Pennsylvania, The
Bell Telephone Laboratories Inc.
Bendix Radio Division, The Bendix Corp.
Bendix Systems Division, The Bendix Corp.
Bliley Electric Co.
Bruno-New York Industries Corp.
Budd Electronics, Inc.
Burroughs Corp.
California Water & Telephone Co.
Cambridge Thermionic Corp.
Capitol Radio Engineering Institute, Inc.
Carolina Telephone & Telegraph Co.
Central Technical Institute
Chesapeake & Potomac Tel. Co., The
Cincinnati & Suburban Bell Tel. Co., The
Collins Radio Co.
Comptometer Corp.
Contraves Italiana S.p.A.
Convair/Pomona, Convair Division of General Dynamics Corp.
Cook Electric Co.
William C. Copp & Associates
Copperweld Steel Co.
Cornell-Dubilier Electric Corp.
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Craig Systems, Inc.
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Developmental Engineering Corp.
Diamond State Telephone Co., The
Dictaphone Corp.
DuKane Corp.
Eastman Kodak Co.
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General Dynamics/Electronics, Division of General Dynamics Corp.
General Telephone & Electronics Corp.
Gilfillan Bros. Inc.
GP Engineering Services, Inc.
Gray Manufacturing Co., The
Hallamore Electronics Co.
Hallicrafters Co., The
Hazeltine Electronics Division, Hazeltine Corp.
Heinemann Electric Co.
Hoffman Electronics Corp., Military Products Div.
Hogan Faximile Corp.
Hughes Aircraft Co.
I. D. Precision Components Corp.
ITT Europe
Illinois Bell Telephone Co.
Indiana Bell Telephone Co., Inc.
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Instruments for Industry, Inc.
International Business Machines Corp.
International Resistance Co.
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Jansky & Bailey, a Division of Atlantic Research Corp.
Jensen Manufacturing Co.
Jerrold Electronics Corp.
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Laboratory for Electronics, Inc.
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Litton Industries, Inc.
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Maxson Electronics Corp., The
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Michigan Bell Telephone Co.
MITE Corp. (formerly Teleprinter Corp.)
Montgomery Co., The
Motorola Inc.
Mountain States Telephone & Telegraph Co., The
Mullard Ltd.
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Southern Bell Telephone & Telegraph Co.
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Stanford Research Institute
Stewart-Warner Electronics
Surprenant Mfg. Co.
Sylvania Electric Products Inc.
Technical Materiel Corp., The
Telectro Industries Corp.
Telephonics Corp.
Telerad Division, The Lionel Corp.
Teletype Corp.
Texas Instruments Incorporated
T.M.C. (Canada) Ltd.
Tung-Sol Electric Inc.
Union Carbide Corp.
United Telephone Co. of Missouri
United Transformer Corp.
Varian Associates
Vitro Electronics, Division of Vitro Corporation of America
Waterman Products Co., Inc.
Webcor, Inc., Electronics Division
West Coast Telephone Co.
Western Union Telegraph Co., The
Westinghouse Electric Corp.
Westrex Corp., a Division of Litton Industries, Inc.
Wheaton Engineering Div., Hurletron, Inc.
Wheelock Signals, Inc.
Wilcox Electric Co., Inc.
Wisconsin Telephone Co.
Wollensak Optical Co.
Xerox Corp.
Zenith Radio Corp.

Association affairs

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AFCEA CHAPTER ORGANIZATION

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REGION A

Regional Vice President—Robert B. Richmond, General Radio Co., West Concord, Mass. ***New England States, New York, New Jersey.***

BOSTON: Pres.—E. T. Rigney, Trans-Sonics, Inc., P.O. Box 328, Lexington, Mass. Sec.—W. Melanson, Cambridge Thermionics Corp., 447 Concord Ave., Cambridge.

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REGION B1

Regional Vice President—George C. Ruehl, Jr., Electronic Aids, Inc., 2118 St. Paul Street, Baltimore, Md. ***Delaware, District of Columbia, Maryland, Eastern Pennsylvania and Virginia.***

BALTIMORE: Pres.—Cdr. Bob Kirsten, USCG, U. S. Coast Guard Yard, Curtis Bay, Baltimore 26, Md. Sec.—Thomas E. Thompson, Jr., The Martin Company.

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WASHINGTON: Pres.—W. W. Alvis, Western Union Tele. Co., 425 13th St., Penna. Bldg., Rm. 544, Wash. 4, D. C. Sec.—W. Hulse, Westinghouse Electric Corp., 1625 K St., Rm. 204, Wash. 6, D. C.

REGION B2

Regional Vice President—Paul H. Clark, Radio Corporation of America, 224 N. Wilkinson St., Dayton, Ohio. ***Kentucky, Ohio, West Virginia and Western Penn.***

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REGION C

Regional Vice President—W. K. Mosley, Southern Bell T&T Co., Hurt Bldg., Atlanta, Ga. ***Southeastern States along Atlantic and Gulf coasts—from North Carolina to Louisiana including Tennessee.***

ATLANTA: Pres.—Capt. I. J. Schwartz, USN, USN Air Station, Atlanta, Merritt, Ga. Sec.—M. S. Butler, P. O. Box 685, Atlanta Airport, Atlanta 20, Ga.

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NORTH CAROLINA: Pres.—Col. P. Van Sloun, XVIII Airborne Corps, Ft. Bragg, N. C. Sec.—H. N. Simpson, Carolina Tel. & Tel. Co., Tarboro, N. C.

NORTHWEST FLORIDA: Pres.—Col. S. K. Briggs, 708 Osegola Cir., Eglin AFB, Fla. Sec.—Maj. N. E. Zielinski, Hq. APGC, Elgin AFB, Fla. Sec.—W. E. Shine, 505 Gaffney Rd., Eglin AFB, Fla.

ORANGE: Acting Pres.—Vincent Meder, 744 S. Hampton, Orlando, Fla.

PENSACOLA: Pres.—Lt. Cmdr. H. M. Young, 4216 Acacia Dr., Pensacola, Fla. Sec.—D. E. Hansen, 208 Emerald Ave., Pensacola.

REDSTONE-TENNESSEE VALLEY: Pres.—Col. Earl J. Dotson, Sig. Office Hq. USA Ordnance Missile Command, Redstone Arsenal, Ala. Sec.—Lt. Col. Henry B. Holmes, III, AOMC Sig. Office, Redstone Arsenal, Ala.

SOUTH CAROLINA: Pres.—H. L. Lackey, Southern Bell Tel. & Tel. Co., Columbia, S. C. Sec.—K. Hora, Southern Bell T&T Co., Ower Bldg., Columbia, S. C.

REGION D

Regional Vice President—Maj. Gen. Harry Reichelderfer, USA (Ret.), Southwest Research Institute, 8500 Culebra Rd., San Antonio, Tex. ***New Mexico, Texas, Oklahoma, Arkansas.***

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NORTH TEXAS: Pres.—R. T. Shiels, Anaconda Wire & Cable Co., 1201 Fidelity Union Life Bldg., Dallas 1. Sec.—Robert J. Novak, AT&T Co., 212 No. St. Paul St., Dallas.

SOUTH TEXAS: Pres.—Col. A. Burke, Hqs., 4th U. S. Army, Ft. Sam Houston, Texas. Sec.—W. Gillum, (same address).

TINKER-OKLAHOMA CITY: Pres.—W. J. Cook, P. O. Box 5766, Midwest City, Okla. Sec.—R. E. Davis.

WHITE SANDS MISSILE RANGE: Pres.—S. D. Cozby, 704 Sugeant St., White Sands, N. M. Sec.—C. E. O'Meara, 1400 S. Luna, Las Cruces, N. M.

REGION E

Regional Vice President—Walter H. Pagenkopf, Teletype Corp., 5555 Touhy Ave., Skokie, Ill. ***Michigan, Indiana, Illinois, Wisconsin, Minnesota, Iowa, Missouri, Kansas, Nebraska, North Dakota, South Dakota, Wyoming, Colorado.***

CHICAGO: Pres.—Walter H. Flinn, Illinois Bell Tel. Co., 212 W. Washington St., Rm. 1601, Chicago 6, Ill. Sec.—Sanford Levey, 1303 Lincoln Ave. So., Highland Park, Ill.

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SCOTT-ST. LOUIS: Pres.—Col. C. W. Evans, USA (Ret.), Southwestern Bell Telephone Co., 1010 Pine St., Rm. 827, St. Louis 1, Mo. Sec.—A. L. Eisenmayer, P.O. Box 456, Trenton, Ill.

REGION F

Regional Vice President—Lt. Cdr. Ray E. E. Meyers, USN (Ret.), Consultant, 717 Anderson Way, San Gabriel, Calif. ***Arizona, Utah, Nevada, California, Idaho, Oregon, Montana and Washington.***

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GREATER LOS ANGELES: Pres.—John W. Atwood, Hughes Aircraft Co., Culver City, Calif. Sec.—Joseph H. Goodrich, Pacific Tel. & Tel. Co., 737 S. Flower St., Los Angeles 17, Calif.

SACRAMENTO: Pres.—R. C. Berner, Pacific Tel. & Tel. Co., 4501 Arden Way, Sacramento 25, Calif. Sec.—Miss Ethel Klusman, 4925 Marconi Ave., Carmichael, Calif.

SAN DIEGO: Pres.—Capt. B. L. Bailey, USN, Cmd. Off. Miramar Naval Air Station, Miramar 45, Calif. Sec.—J. C. Orthel, 5483 Redding Rd., San Diego 15, Calif.

SAN FRANCISCO: Pres.—Col. H. L. Davis, Jr., 331 Infantry Terrace, Presidio of San Francisco, Calif. Sec.—H. W. Weddell, Rm. 117, Bldg. 35, Presidio of San Francisco, Calif.

SANTA BARBARA: Pres.—RAdm. Clarence C. Ray, 63 Manzanita Lane, Star Route, Santa Barbara, Cal. Acting Sec.—E. E. Foley, P.O. Box 636, Santa Barbara, Calif.

SEATTLE: Pres.—RAdm. H. H. McCarley, USN, 436 168th St., S.E., Bellevue, Wash. Sec.—W. E. Cruse, 4001 W. Concord St.

EUROPEAN REGION

Regional Vice President—Brig. Gen. Kenneth F. Zitzman, USA (Ret.), International Standard Engineering, Inc., 40 Rue de Sevres, Boulogne Billancourt Seine, France.

FRANKFURT: Acting Pres.—Ralph L. Prokop, USA Procurement Center, APO 757, N. Y.

LONDON: Pres.—Lt. Col. S. B. Hunt, USMC, Cincnelm, Box 91, FPO, N. Y., N. Y. Sec.—Lt. Col. J. C. Posey, HQ. 3d COMM. GP., APO 125, N. Y., N. Y.

PARIS: Pres.—RAdm. T. A. Torgerson, HQ. U.S. EUCOM C E, APO 123, N. Y., N. Y. Sec.—Maj. John E. Mills, 7th Signal Battalion, SHAPE, APO 55, N. Y., N. Y.

SWITZERLAND: Pres.—B. R. Dean, 13 Quai de L'ile, c/o RCA, Geneva, Sec.—Lt. Col. A. David, Royal Signal, British Army, U. N., Geneva.

PACIFIC REGION

Regional Vice President—Brig. Gen. Douglas Williams, USAF, Staff CINCPAC, APO 953, San Francisco, Calif.

HAWAII: Pres.—Col. W. A. Simpson, USA, Signal Office, Hq. USARPAC, APO 958, San Francisco, Calif. Sec.—Lt. Col. G. A. Kutkjian, USA (same address).

KOREAN: Acting Sec.—Col. J. E. Gonseth, Jr., J6 Div., UN Command, APO 301, San Francisco, Calif.

MARIANAS: Pres.—Cmdr. C. J. Alley, USN, U. S. Naval Comm. Sta., Navy 926, FPO, San Francisco, Calif. Sec.—Lt. Cmdr. W. Scott, USN, P. O. Box, FPO, San Francisco, Calif.

OKINAWA: Pres.—Lt. Col. L. P. Wynne, Cmdr. 1962nd AACS Squadron, APO 239, San Francisco. Sec.—E. N. Dotson, USCAR, APO 331, San Francisco.

PHILIPPINE: Pres.—Lt. Col. A. W. Hall, STARCOM, QTRS. 31 Clark, U. S. Acan Station, Philippines, APO 74, San Francisco, Calif. Sec.—J. C. Behrick (same address).

TOKYO: Pres.—Capt. W. H. Kreamer, USN, Staff COMNAVFOR, Japan, FPO, San Francisco, Calif. Sec.—Lt. W. E. Trelford, USN (same address).

CHAPTERS AT LARGE

ALASKA: Pres.—Col. H. L. Hughes, USAF, Hq. Alaskan Air Command, APO 942, Seattle, Wash. Sec.—J. T. Harris, Anchorage Tel. Co., Box 400, Anchorage, Alaska.

SAN JUAN: Pres.—W. Siddall, Radio Corporation of Puerto Rico, P. O. Box 3746, San Juan 18, P. R. Sec.—A. R. Crumley, Jr., Crumley Radio Corp., Box 10073, Caparra Heights, San Juan.

Chapter News

REGION A

New York

The annual social gathering was held at the Officers Club at Governors Island in New York Bay, June 28. The dinner dance was under the sponsorship of Colonel Charles A. Stanley, USA, and his staff.

REGION B2

Dayton-Wright

An informal buffet for 100 members and their guests was held June 23 at the Gentile Officers Club, Dayton, Ohio.

The evening was highlighted by the installation of incoming officers. Colonel Robert L. Salzarulo, retiring chapter president, turned the official charter and documents over to newly-elected chapter president Allan F. Schmahl, manager, Customer Relations, Central Region, Electronic Systems Division of Sylvania Electric Products, Inc.

REGION C

Cape Canaveral

A luncheon meeting was held July 20 in the Missile Room of the Officers Club at Patrick Air Force Base, Fla.

Lieutenant Walton Wells, a chapter vice president introduced guest speaker, George Shaw, vice president of Radiation, Inc. Mr. Shaw's subject was "Space Communications." Mr. Shaw discussed only the "in-close" communications area of space and defined this as the near planets and orbital satellites. He discussed some of the aspects of relayed communications by use of satellites and pointed out certain problems associated with the increased area of coverage in scheduling or assigning frequencies in the new short range "line of sight" spectrum.

Mr. Shaw pointed out that in military technological developments, it was possible that a stalemate could be reached in destructive weapons. He stated that when this occurred, the war would shift to the struggle for the control of the minds of men. This would make a nation's communications system a weapon of war. This struggle would, through the use of repeater satellites, take place on a world wide basis.

The Canaveral Council of Technical Societies quarterly meeting will be held September 11. The subject will be "Application of Photo Optics in Space."

A fall seminar, sponsored by the Joint Council, will be held in October and November.

Chapter president George Meredith announced that the symposium sponsored by the chapter would be held next spring in the Cape Canaveral area.

Louisiana

A dinner meeting was held July 25 at the Commissioned Officers Mess, Camp LeRoy Johnson, Lakefront, Louisiana.

Stephen Lichtblau, Meteorologist in charge of the U.S. Weather Bureau at New Orleans was guest speaker. His topic was "Weather and Hurricane Problems."

Middle Georgia

Major General Harold Maddux, vice president of Continental Air Command was guest speaker at the July 10 dinner meeting. General Maddux outlined the importance of CONAC's recovery program throughout our country for the 45 members and their guests attending the meeting.

Chapter president N. H. Rogers and Major Robert Hill gave a brief report on the 15th Annual AFCEA convention.

Newly elected officers are president, John Booth, Southern Bell Tel. and Tel. Co.; vice president, Major Robert Hill, Robins Air Force Base; vice president, Major E. H. Gibson, Robins Air Force Base; secretary-treasurer, J. D. Walker, Southern Bell Tel. & Tel. Co.

Redstone-Tennessee Valley

The application for the new chapter charter was approved by AFCEA headquarters August 1.

At an organizational meeting held July 14, the following were elected as interim officers: chapter president, Colonel Earl J. Dotson, signal section of the Army Ordnance Missile Command; 1st vice president, Sears Lee, district sales manager of Southern Bell Telephone Company; 2nd vice president, Ed Hildreth, chief of communications, Marshal Space Flight Center; secretary, Lieutenant Colonel Ben Holmes, signal section, AOMC; and treasurer, J. M. Street, district engineer, Southern Bell.

The official charter will be presented at a subsequent date.

Dayton-Wright—(Photo left) Newly elected officers: (Seated L to R) E. Cecil Hill, executive vice president; Allan F. Schmahl, president; Col. R. L. Salzarulo, retiring president, and Marlene O'Neal, secretary. (Standing L to R) M. Filcik, Col. J. K. Schloss, Ruby Brothers, Charles Kovac, and Col. S. J. Wisniewski, all vice presidents. (Photo right) **New York**—(front row) Col. and Mrs. C. A. Stanley, (second row) Mrs. J. Z. Millar, Mrs. H. Bang, Mrs. G. Montgomery, Mrs. F. Gunther. (top row) J. Z. Millar, H. Bang, G. Montgomery, F. Gunther.

REGION E

Greater Detroit

Walter H. Pagenkopf, regional vice president was a special guest at the June 23 meeting held at Bendix Systems Division, Ann Arbor, Michigan. Mr. Pagenkopf spoke on the progress of AFCEA.

Prior to the meeting, a buffet dinner was held at Plymouth, Michigan.

Guest speaker, Jay E. Browder, spoke on "Satellite Communications." Mr. Browder used charts, actual photographs and artists' conceptions to illustrate his points.

Chicago

A dinner meeting was held in the Army headquarters building on Hyde Park Boulevard in Chicago. Colonel J. H. Fulton, Signal Officer, U. S. Fifth Army was host for the meeting. Highlighting the meeting was a demonstration of new techniques in visual communication using an overhead projector.

In the election of new officers, Walter H. Flinn, general security manager, Illinois Bell Telephone Company, was named chapter president. He succeeds William L. McGuire, vice president, Automatic Electric Company who had held the office for two terms.

Early in the program, members and their guests toured Signal Corps Mobile Calibration facilities, and witnessed the presentation of AFCEA's Chicago Chapter outstanding achievement award to Sergeant Sonny L. Rissa, 409th Signal Company (Base Depot). A similar award was made in absentia to Sp4 Keith K. Kirkland, 263d Signal Detachment (Intelligence) who was away at camp at the time. The awards are presented annually to outstanding enlisted men in the Reserve and National Guard Technical Service Units.

Newly elected officers and directors of the chapter who will serve with president Flinn are vice presidents: Harry Bendsten, director of sales, Paraplegics Manufacturing Company, Inc.; Darwin H. Deaver, president, Automatic Electric Sales Corporation; Robert F. Halligan, Hallicrafters Company; Arthur J. Schmidtt, chairman of board, Amphenol-Borg Electronics Corporation; Carrington H. Stone, Carrington H. Stone Engineers and Exporters; James F. Weldon, U.S. Department of Commerce.

Sanford H. Levey, president Lukko Sales Corporation was re-elected as secretary-treasurer.

Directors elected were Raymond K. Fried, Feinberg & Fried; Colonel James H. Fulton, Signal Officer, U. S. Fifth Army; E. E. Kleinschmidt, president Kleinschmidt Division, Smith-Corona Marchant, Inc.; Irving Koss, general manager, Chicago Military Electronics Center, Motorola, Inc.; A. P. Lancaster, vice president, Manufacturing Area B, Western Electric Company, Inc.; Thomas J. Lloyd, vice president, Admiral Corporation; Henry J. McDonald, secretary & general counsel, ITT Kellogg; Richard Morey, vice president, Morey & Company; Captain Robert H. Northwood, USN Electronics Supply Office; Colonel James R. Ourand, chief, Chicago Air Procurement District USAF; Walter Pagenkopf, vice president, manufacture, Teletype Corporation; L. A. Pereira, president, L. A. Pereira and Company; William L. McGuire, vice president and general commercial manager, Automatic Electric Company. There are two vacancies on the board. They will be filled when the successors to Colonel Turner W. Gilman, former Commanding Officer of the U. S. Army Signal Supply Agency, Chicago, and Lieutenant Colonel Carl E. Trexler, U. S. Air Force System Command, Chicago, are named.

Chicago— Sgt. Sonny Bissa receives AFCEA Achievement Award from William McGuire, past president Chicago Chapter while (first on left) Walter Pagenkopf, vice president of Region E, AFCEA, (second right) Col. James Fulton, Sig. Officer 5th USA, and Walter Flinn, newly elected president look on.

REGION F

Sacramento

Jerome W. Hull, vice president and general manager, northern counties area of Pacific Telephone was guest speaker at the dinner meeting held July 13, at the Pacific Telephone Company, Sacramento. Mr. Hull's topic was "Communications and the Future." He said that the Bell System has proposed a plan whereby 25 to 30 "active" satellites in polar orbits at an altitude of about 7,000 miles could provide communication service between the United States and Hawaii. These satellites would be capable of receiving, amplifying and transmitting messages to overseas ground receiving stations.

Ira B. Cave, Pacific Telephone; Donald W. Kinnell, A.C.E.; Colonel Leo Tamamian, commander of Signal Depot; and William C. White, Graybar Electric Co. were nominated and approved as members of the Board of Directors.

Seattle

A dinner meeting was held July 12, at the Benjamin Franklin Hotel, Seattle.

Russell E. Winslow and Leslie R. Vincent gave a report on the 15th Annual AFCEA Convention. Mr. Winslow covered the general aspects of the Convention and proceeded to describe the panel discussions and technical papers in some detail. Mr. Vincent's report emphasized the procedures employed by other Chapters to stimulate membership.

EUROPEAN CHAPTER

London

A dinner meeting was held June 29, at the Columbia Officers Club. At this annual business meeting, the following were re-elected: president, Lieutenant Colonel Sanford B. Hunt, USMC; vice president, Colonel A. H. Snider, USAF; 2nd vice president, M. Harvey Schwartz; 3rd vice president, Lieutenant Colonel John T. Newman, USA; associate vice president, Sir Reginald Payne-Gallwey; associate vice president, Sir Harold Bishop; associate vice president, L. T. Hinton; assoicate treasurer, Colonel John Reading.

Newly elected officers are the following: associate vice president, Major General A. M. W. Whistler; associate vice president and chairman program committee, W. G. J. Nixon; Secretary, Lieutenant Colonel John C. Posey, USAF; associate secretary, John Savage; treasurer, Lieutenant Colonel Galen M. Haven, USAF.

PACIFIC REGION

Okinawa

At the June 16 meeting on Okinawa, the following new officers were elected: president, Lieutenant Colonel Lawson P. Wynne, USAF, Commander, 1962nd AACS Squadron; 1st vice president, Colonel Erwin E. Sullo, Signal Officer, USA, Ryukyu Islands; 2nd vice president, Kotaro Kamimura, president Ryukyu Telegraph and Telephone Public Corporation; and secretary, Earle Dotson, chief, Transportation and Communications Division, U. S. Civil Administration of the Ryukyu Islands. Charles Axsom was re-elected as treasurer.

The new officers plan to establish a program of activities for the chapter.

Association News

Lt. Gen. Gordon A. Blake presents the Oak Leaf Cluster to the Air Force Commendation Medal to Capt. Donald B. McBride.

Lieutenant General Gordon A. Blake

AFCEA is profoundly pleased to announce to its membership General Gordon A. Blake's recent promotion to Lieutenant General, USAF. In taking over his new assignment at CONAC we wish him continuing success. General Blake has given unselfishly of his time for many years in advancing the aims and objectives of AFCEA. As a national officer and director, and more recently as regional vice president of our Pacific Ocean Area, he has contributed so outstandingly to the forward progress of the Association as to warrant our highest commendation and appreciation.

Oak Leaf Cluster

A new operational system allowing flexible capability to control airborne forces securely and quickly has earned Captain Donald B. McBride his third award for outstanding service.

The first Oak Leaf Cluster to the Air Force Commendation Medal was presented recently at Pacific Air Forces Headquarters in Hawaii by Major General Gordon A. Blake, Chief of Staff for the Command. Previous awards were the Air Force Commendation Medal and the Army Commendation Ribbon.

AFCEA Honorary Members

The Association is privileged to announce the acceptance of honorary memberships in AFCEA by General Curtis E. LeMay, recently appointed Chief of Staff, USAF, and Admiral George W. Anderson, Jr., recently appointed Chief of Naval Operations.

Both of these distinguished leaders are well known to AFCEA and each has contributed either by public appearance, as participants at our National Convention, or to SIGNAL magazine. We welcome them most heartily into our organization.

General LeMay and Admiral Anderson replace former Chiefs of Services, General Thomas F. White, USAF, and Admiral Arleigh A. Burke, USN, both of whom supported and made many outstanding contributions to the progress of our organization. We wish General White and Admiral Burke a happy retirement.

New Vice President of AFCEA

On the assumption of the new Air Force Communications Service Command by Major General Harold W. Grant, Major General John B. Bestic, USAF, Director of Telecommunications, who succeeded General Grant as Director of Telecommunications, was unanimously elected by the Executive Committee to serve as a national vice president for the Association. The Association is proud to have General Bestic aboard and to have him serve with our two other distinguished service communicators, Rear Admiral Frank Virden, USN, Director of Naval Communications and Major General Ralph T. Nelson, USA, Chief Signal Officer.

Dr. Edward G. Witting, former Deputy Assistant Secretary of the Army for R&D, receives an Exceptional Civilian Service Medal from Secretary of the Army Elvis J. Stahr, Jr. Dr. Witting, who resigned last July, was instrumental in development, organization and coordination of many complex phases of R&D. From left, General George H. Decker, Army Chief of Staff, Secretary Stahr, Dr. Witting, Mrs. Witting and their daughter, Joyce.

AFCEA

Executive Committee Meets

Frank A. Gunther, recently elected AFCEA National President has announced that the first meeting of the Executive Committee will be held in Washington, D. C. during the latter part of September. Official notification will be sent to all members of the Executive Committee in sufficient time to permit them to make plans to attend.

New Group Member

Datronics Engineers, Inc. has joined the Association as a new group member. The company manufactures communications-electronics R&D equipment, and designs and installs telecommunications systems. L. V. Pellettier, personnel director, has been named company representative.

Those named to be full members are John T. Gauthier, president; Charles J. Seeley, executive vice-president; Dr. Z. Prihar, executive assistant to the president; Dr. Charles R. Burrows, vice president engineering and research; William E. Yest, Jr., vice president; Lester G. Sturgill, director of antenna engineering; Walter H. Holser, director of systems engineering; James C. Sutton, assistant director of systems engineering; Joseph R. Lowe, Jr., senior engineer; John Strand, vice president, Strand Engineering.

Appointment of Regional Vice Presidents

In accordance with section 4, Article IV, of the national constitution by-laws, AFCEA's newly elected president will present to the Executive Committee for approval his slate of regional vice presidents for the coming year. According to the constitution, "each regional vice president shall serve without pay and shall hold office from the time of his appointment and confirmation by either the Board of Directors or the Executive Committee until the next annual meeting of the Association and thereafter until his successor has been appointed and confirmed."

Captain Robert H. Weeks, USN Selected for Flag Rank

Captain Robert H. Weeks, USN, Deputy Director for Communications, is a recent Rear Admiral selectee.

Captain Weeks has been a contributing editor of SIGNAL since April 1959.

A 1932 Naval Academy graduate, Captain Weeks has had duty both in the Far East and in Europe. He has served in his present assignment since August, 1958.

Captain Weeks was awarded the Legion of Merit for his "Exceptionally meritorious conduct" as Assistant Fleet Communications Officer on the staff of the Commander in Chief, U. S. Atlantic Fleet during World War II. As commanding officer of the *USS James C. Owens* (DD-776), he participated in the "Palestine Patrol" of 1947, his ship being one of the first American vessels to fly the United Nations flag.

From 1949 until 1951, Captain Weeks was Assistant Navy Department Communication Officer attached to the Office of the Chief of Naval Operations, after which he had duty as Chief of Communications on the staff of the Supreme Allied Commander, Atlantic.

Before reporting to his present assignment, Captain Weeks was Commander Destroyer Squadron 10.

Among his medals and decorations, he also holds a Letter of Commendation Medal from the Secretary of the Navy and the Navy Command At Sea Insignia.

In Memoriam

National Headquarters regrets reporting the recent death of William A. MacDonald, chairman of the board of Hazeltine Corporation. Earlier this year, he was elected a director of the Western Union Telegraph Company. Mr. MacDonald had been a member of AFCEA since 1954.

NEW MEMBERS

Listed below are new members of AFCEA who have joined the Association during the months of June and July. Members are listed under the chapter with which they are affiliated. Amateur radio operators are listed with their call letters.

Alaska

Charles U. Bair
Chester M. Bowman
C. F. Buntgens, Jr.
Andrew C. Cowan
Harry C. Crawford
D. A. Evenson K9JYX
Col. L. S. Gardner
Robert S. Gray
Frank M. Hageman
J. T. Harris, Jr.
Floyd L. Hoglen
John F. Hoover KL7CEY
Maj. E. P. Kocel
R. L. Leonard
C. E. Lyons KL7BDY
I. W. McCormack
Alton O. McLane
Harold W. Moye
H. L. Patterson
Mrs. Romayne L. Potosky
Capt. L. N. Rowland
Lt. Gerald D. Sparks
Maj. C. W. Stevens
M. R. Weatherly KL7BPX
John R. Ziegler
Gerald L. Flynn

Arizona

Donald W. Green
Douglas Keene
Edward M. Keller K7KYT
Dennis Kodimer
Jeffrey L. Patrick
Miss Eileen Rowe
F. N. Smith
Terrell D. Sparks
John W. Voights
Allan Mense—K7GHN
Kenneth J. Saxman

Atlanta

W. J. Keating, Jr., W4GXU
Charles Morgan, Jr.
P. M. Prescott
W. E. Tucker
Louis E. Abernathy
H. George Beckroge
Robert J. Dellenback
Joseph M. Fennelly
J. W. Kingsbury

Augusta-Fort Gordon

Chester A. Bolin
Lt. Benny L. Booth
Lt. M. B. Bostian
SFC Robert C. Brizius
SFC George Demitrales
James M. Faglier
Harry P. Folwell
Robert F. Hagen, Jr.
Curt M. Huff
Lt. Robert A. Luey
SP5 D. J. McFarland
SFC F. R. McMahon
Neal M. Merritt
H. A. Musselwhite
Charles E. Parsons
Lt. Michael J. Toia
Lt. James M. White
MSgt. David Wolfert
1st Lt. Peter J. Chittick, USA
Earl H. Lindsey
2nd Lt. D. R. McKeen, USA
Capt. Walter W. Piercy, USA
Maj. Jay W. Pinkerton, USA

Baltimore

William E. Connors K3AWU
Richard C. Leonard
Maj. Harry C. Frank, Jr.
1st Lt. Franklyn W. Gross
S-Sgt. James E. Hemann
2nd Lt. Robert R. Keeney
Dr. C. Martin Rhode
Sgt. Donnie R. Rooks
Wojf Walter E. Stair
F. Neil Upchurch
M-Sgt. Paul E. Williams
Sgt. Earl Wyckoff

Boston

Orville D. Page
Richard D. Holbrook
Bayard Robb

Cape Canaveral

Elgin J. Kirkland

Central Florida

Dean Butts

Chicago

Harry E. Allen
Charles R. Hohmann
Robert J. Larson
Frank D. Lintern
John J. Melvin
James F. Novak
Eugene G. Van Deveer
Glenn E. Webster W9NQM
O. H. Williams
Horace L. White
N. H. Bennett
I. D. Byers
P. H. Davis, Jr.
Robert Emlander
A. J. Gartner
Jim Hoekje
E. R. Husleberg
Frank McCarthy
J. G. Moffat
Russ Neff
J. A. Reinhardt, Jr.
J. A. Reinhardt
Stanley E. Rendell
Joseph J. Quinlan
R. L. Schneider
William Stillwell
James Tatum
J. E. Wilkinson

Cincinnati

George H. Geick
Lt. Col. A. P. Potts, Jr.

Dayton-Wright

Louis J. Bruno
William C. Elcan
James O. Fassett
Arthur L. Swygard
R. V. Hammond
Clarence A. Pearce
S. Tarnoff

Decatur

Maj. James M. Beaumont

Fort Monmouth

Adamant Brown
Philip A. Celli
John F. Schneider, Jr.
Michael B. Kraus—W2HKY
H. Wilson Miller—K2CSH
C. Phillip Stemmer

Frankfurt

Lt. Thomas G. Turpin

Greater Detroit

Ivan L. Deyoung

Greater Los Angeles

R. T. Cowden
Jean C. Gregory
D. Hensley
E. A. Painter
Harry P. Sparks
R. O. Bergstrom
E. F. Coy
Frank P. Merritt, Jr.—K6YCX
E. Swanson
Michael E. Thornton

Gulf Coast

Perry A. Adams
Lt. D. L. Agnew
John C. Bauler, Jr.
Hugo E. Borchert
Walter M. Bounds
Macrae B. Brooke
Capt. John W. Buck
Orville J. Callahan
Vernon L. Clements
SSgt. C. G. Douglas
Lt. John D. Douglass
Walter L. Dringman
Donald Foster
MSgt. R. L. Gillespie
SSgt. James W. Gray
MSgt. Thomas F. Grogan
Richard C. Hawver
Maj. Wickliff H. Horne
George A. James
TSgt. M. S. Kabaj, Jr.
Adolph Ladner
Allan S. Lessem
William J. Lewis
Thomas T. Lynch, Jr.
Fred D. McDonald
Maj. D. D. McKenzie
Capt. K. T. McKim
Lenox T. McKimmey, Jr.
Capt. Carl W. Meyer
Frank B. Moore
MSgt. John J. Nelson
David A. Parsons
Louis Ramirez-Pabon
A-1C John Ratola
MSgt. Robert R. Rector
MSgt. Richard D. Roark
Ralph H. Rush
James E. Sanford
Fred C. Schwed
Cecil R. Scott
James H. Sexton
James P. Smalls
Eugene S. Sommerville
Richard W. Stevens
Victor C. Styles
Capt. Stanley A. Taylor
Maj. Milton Y. Veynar
Lavon Weatherford
SSgt. John E. Wright
Don O. Zellner
T-Sgt. George P. Edmonston, USAF—K4IVU
Carl A. Kother
S-Sgt. Bobby G. Williams

Hawaii

Kenneth H. Quin
Col. Walter B. Bee, USA
Maj. Thomas G. Hayes, USAF
Col. Wm. A. Lafrenz, USAF
Arlon M. F. Tom

Kansas City

Wallace O. Miller
Don Zehder

Lexington-Concord

George H. Barrett
Robert N. Benedict
Henry J. Bopp, Jr.
Robert K. Cross W2ZDB
Robert W. Fischer
James J. Johnston
Maj. George E. Tuttle
Paul J. Valentino
A. Gerald Wilson
Edward T. Buxton, Jr.
Sidney Kaufman

London

W. L. Freebody
Lt. Col. F. W. Stoneman
Maj. Gen. A. M. W. Whistler
Ivor Zelvin
W. Allen Bridges
T. R. M. Longman
Christopher D. Oswald
Frank J. Pieski
D. S. Ridler
D. A. Weir

Louisiana

Edward L. Bottom

Marianas

Lt. James T. Boyle

Middle Georgia

Brig. Gen. Wilbur W Aring
C. C. Armistead
David L. Ballard
James B. Booth
Edwin C. McKinnon
Alan D. Miller—W4RGD
Parmelee Ward

New York

A. Barbella
N. Darsch
A. Gregson
M. Halpern
H. H. Hentrich
Robert S. Mason
L. P. Oberst
S. Edwin Piller
H. Polak
John A. Regan
Leo Stamler
Howard A. Zeimer
J. Halfred Bacon
L. Collier
Ernest W. Faucher
Brian Fernandez
Don T. Fonshill
J. S. Frank
W. J. Henderson
Walter G. Herr
W. W. Hill
William R. Hyatt
Williar R. James
A. Lawrence Karp
Hubert L. Kertz
Walter Masnik
William C. Meyer
Frank Nickel, Jr.
J. R. Rae
John J. Seffern
Robert J. Seymour
Anthony L. Spina
Harold A. Stoll
Charles E. Topping, Jr.
Cmdr. J. Twomey, USN
R. D. Watson

North Carolina

Jason B. Deyton, Jr.
Lewis R. Irvin

Northeastern University

William D. Allan
James D. Ryan

Okinawa

Crispulo F. Arcinas
Takeshi Aoki
Capt. N. C. Brigham
John E. Higgins
David E. Hudson
Henry T. Morimoto
Jack C. Lentz
Tomakiyo Shikina
Col. Erwin E. Sullo
William E. Waldo
Ernest A. Ward—W7VQD

Paris

Maj. Mariano C. Arienzo
David R. Cook
Ross T. Sampson
Francis Wellesplein

Pensacola

Federic T. C. Brewer

Philadelphia

Ira Albom
Leonard L. Barol
Donald F. Blumberg
Robert C. Gunther
Frank W. Mayock
William J. Peltz
Lt. Col. Ronald Ransier
Lt. Col. Philip Sansone
R. H. Gaynor
C. Paul Young

Philippine

Cmdr. Earl L. Oliver, USN
Enrico G. Rondina

Pittsburgh

Donald E. Bell
John F. Dauster
P. Ralph Donley
Sidney J. Root
Carl I. Schlotter
John E. Werner

Redstone-Tennessee Valley

Wallace F. Bischof
Lt. Col. Wm. D. H. Blackman
John D. Boles
Walter H. Deavers
Anthony A. Demetriou
Capt. John P. Dobbins
Carl E. Duckett
Mac C. Eversole
Robert N. Flint
Elisha Gurfein
Maj. Earl D. Hicks
John A. Higdon
Edward D. Hildreth
Henry B. Holmes, III
Bruner T. Honeycutt
Rexford R. Javins
Jesse B. King
Capt. Kenneth M. Knox
Scears Lee, Jr.
Paul J. Moore—W5KY
James E. Morgan
Emmett M. Peterson, Jr.
John J. Phillips, Jr.
Col. George E. Pickett
Dreyfus O. Rouse
Harry L. Schewert
Watson M. Sharp
Rolf Ursin-Smith
John M. Street, Jr.
Deforest A. Strunk
Paul W. Thompson
Capt. Francis R. Williams

Rocky Mountain

C. L. Scarbrough KØTSP
Roy L. Wyrick
Bruce R. Smith

Rome-Utica

John R. Huckaby
T. Phil Rizzuti

Sacramento

Capt. Jerrell W. Brooks
Harry R. Stronge
Norman J. Thompson
Raymond P. Laurent
George T. Masters—W6GHE
Bernard F. Robey, Jr.
A. Simon
Maj. Clarence E. Wiles
Oswald Zimmerman

San Diego

Cdr. Leon C. Covell
John H. Kelly, III

San Francisco

LCdr. George K. Demas
LCdr. Erwin J. Hauber
Lt. William P. Rodriguez
Charles P. Van Scoy
T. F. Byrnes
Jacob J. Hagopian
Maj. J. E. Rose, USAF Ret.

San Juan

Angel A. Arreche
Julius S. Brisbane
Guy Hudson
Sam C. Long
Harold Martin
Jose E. Munoz
Phillip F. Asencio

Santa Barbara

Mary F. Brennan
Allen R. Matthews

Scott-St. Louis

William M. Graves WØQZZ
Col. T. E. Collins, Jr.—K4USM

Seattle

Delbert H. Taft
Anthony A. Garra

South Carolina

J. E. Butterworth
Capt. R. W. Liebert
Billy M. Millen
Howard M. Robertson
James G. Roe
James C. Vaughan
Clarence C. Jeter, Jr.
William E. Kunz
Capt. Charles H. Witten, USN

South Texas

Ormond F. Henning
Clay W. Smith
Lt. William R. Heathcote
Brig. Gen. Richard B. Moran, USA, Ret.
Robert R. Patton

Southern Connecticut

R. A. St. Clair
Ernest E. Courchene, Jr.
Charles R. Frost
Hubert M. Greist
Norman E. Peterson
H. Stuart Stone
Don G. Zuck
Robert F. Burns
T. J. Canavan
K. A. Waldron

Syracuse

R. J. Drack
Dean L. Sedgwick
Joseph M. Williams

Tinker-Oklahoma

Lawrence C. Brooks W5PYP
James E. Hawkins
Col. Frank T. West

Tokyo

Dr. Masasuke Morita
Arthur E. Parker
Lt. Col. G. I. Wagner
Herman E. Castle
Gerald F. Gray
Maj. George V. Hamson—W6ZHV
Col. Harold E. Russell, USAF, Ret.

Washington

Lt. Col. M. N. Abramovich
Cdr. Thomas Appleby
John H. Bardon
Maj. Cary F. Capps
J. M. Carter
M. Harrison Clark
David Early
E. William Frank
Charles M. Gerold
Floyd A. Glenn
Capt. G. V. Graves
William W. Hamer
George L. Hamrick
Lt. Col. Kenneth P. Hart
O. B. Hartman
Col. J. L. Leidenheimer
J. C. Leifer
Louis Litman
Rudolph Mechelke
Capt. R. W. Rieseberg
Lt. Col. Emmett A. Parrish
George C. Pierce
Hoyle U. Scott
J. W. Souder
Gus S. Souris, Jr.
Howell E. Stevens
Delmar A. Thibodeau
Maj. J. N. Trudell
Maj. A. H. D. Williams
George C. Wetmore
Col. David S. Woods
Lavone G. Agee
Roy L. Boykin
Lt. Gen. Clovis E. Byers, USA, Ret.
Cmdr. Charles F. Concannon, USN, W6RQ
Louis G. Dooley
Douglas M. Early
R. Filipowsky
Alva M. Hill
Gen. Curtis E. LeMay, USAF
B. G. Oldfield
H. H. Robinson
J. H. Rotchrock
Frank O. Strailman, III
Hamilton Treadway

Members at Large

Col. Armando Angelieri
Lt. (j.g.) W. R. Campbell
C. E. Carlyle
M. E. Christopher
Charles G. Compton
Maj. S. J. Duarte
LCdr. Leo J. Farmer
William N. Greer
Clair R. Hershey
Col. Marcus W. Heskett
Thomas E. Hood
Max A. Lekson
W. R. Littell
Lt. Col. William Minton
Raymond W. Pelo
LCdr. C. W. Postlethwaite
Biagio Prezioso
Robert G. Quandt
LCdr. Charles W. Saar
Wesley J. Walimaa
Vittorio A. Bassi
Massimo Borrello
Macchia Corrado
Maj. Vittorio Ferreri, ITA
Gigiana Giorgio
Herve B. Pedrosa
Robert J. Peltz
Lt. John H. Ruehlin, USN

NEWS ITEMS AND NEW PRODUCTS

Sixteen U. S. electronics companies were among the 190 U. S. and Puerto Rican firms which signed up for new Operation Bootstrap factories in the Caribbean Commonwealth during fiscal 1960-61, the Puerto Rico Economic Development Administration has reported.

The new electronics ventures include General Electric, Daystrom, Cannon Electric, Interstate Engineering, Specialty Electronics Development Corp., Electrosolids Corp., Electrospace Corp., National Video Corp., Video Instruments Co., and General Electronic Control Inc.

Products they will produce in Puerto Rico include instruments, mercury buttons, fire-alarms, circuit breakers, portable two-way radios, resistors, electron guns for cathode ray TV tubes, transformers, terminals and radio frequency coaxial connectors.

Noting the rapid growth of hard goods manufacturing in the Caribbean Commonwealth, J. Diaz-Hernandez, Executive Director of EDA's Continental Operations Branch, reported that Puerto Rico's U. S. affiliated electronics industry shipped a record $8,829,000 of electronics products to the mainland in 1960, an increase of 89 percent over 1959.

• • •

United Kingdom exports of electronic products to the U. S. during 1960 totaled $19.6 million—a drop of more than 10 percent from the record level of nearly $22 million in 1959, the Electronics Division, Business and Defense Services Administration, U. S. Department of Commerce has reported.

Shipments of record playing mechanisms, which heretofore accounted for over one-half of the total exports of electronic equipment and parts to the U. S., dropped some 34 percent from $12.4 million in 1959 to $8.1 million in 1960. Substantial gains were made in exports of commercial and industrial equipment, and exports of tubes and components increased appreciably.

United Kingdom exports of electronic products to all countries totaled $163 million in 1960 compared with $155 million in 1959. Despite the drop in shipments to the U. S. last year, this country was by far the largest single market followed by Canada ($13 million), Australia ($10 million) and the Netherlands ($9 million).

Japanese electronics output totaled $1,166 million in 1960 compared with $932 million in 1959. In reaching this record level, the total value of production increased 25 percent over that of the previous year; however, output in 1959 increased by 87 percent over 1958.

In 1960, production of consumer electronic products accounted for 57 percent of the total. Production of television receivers alone totaled $394 million. This represented an increase of 18 percent over 1959, a decided drop from the 118 percent rise between 1958 and 1959.

The drop reflected a levelling off in domestic demand, which was probably attributable to the increasing proportion of Japanese households now having television receivers. According to an official survey conducted in November 1960, about 32 percent of all Japanese households owned receivers; in the large cities the figure was 54 percent.

Other important products of Japan's electronic industries were radio receivers with 3 or more transistors, $169 million; receiving tubes, $86 million; TV picture tubes, $70 million; and transistors, $54 million.

• • •

The memory system installed in the Transit IV-A satellite has received information relayed to it from an injection station in Silver Spring, Md., and the satellite has sent the message back to two stations at the Applied Physics Laboratory of The Johns Hopkins University "with most satisfactory results."

The memory is a simple mechanical type which releases signals at precise intervals, measured by the extremely accurate pulses of an ultrastable crystal oscillator. Transmission from the memory system to the ground takes about 30 seconds and is immediately repeated. New data may be inserted in the satellite when Transit approaches within line-of-sight of the injection station.

Read-out signals of the memory system, which occur on a very accurate time basis, could be used by navigators to set clocks. In the operational system, these signals will provide a world-wide time as well as an accurate navigational reference.

The Rock Island County Civil Defense Training Center, Milan, Illinois, was dedicated last August. The function of the Training Center is to provide all types of Civil Defense training courses, including basic rescue and fire-fighting to the residents of the county. Other Civil Defense agencies are encouraged to use the facilities.

The main building of the Center includes office space and a radio control station. Also included are two class rooms for workshop instruction. Outside buildings are for actual training exercises. The Center was built under the Federal Matching Funds program.

• • •

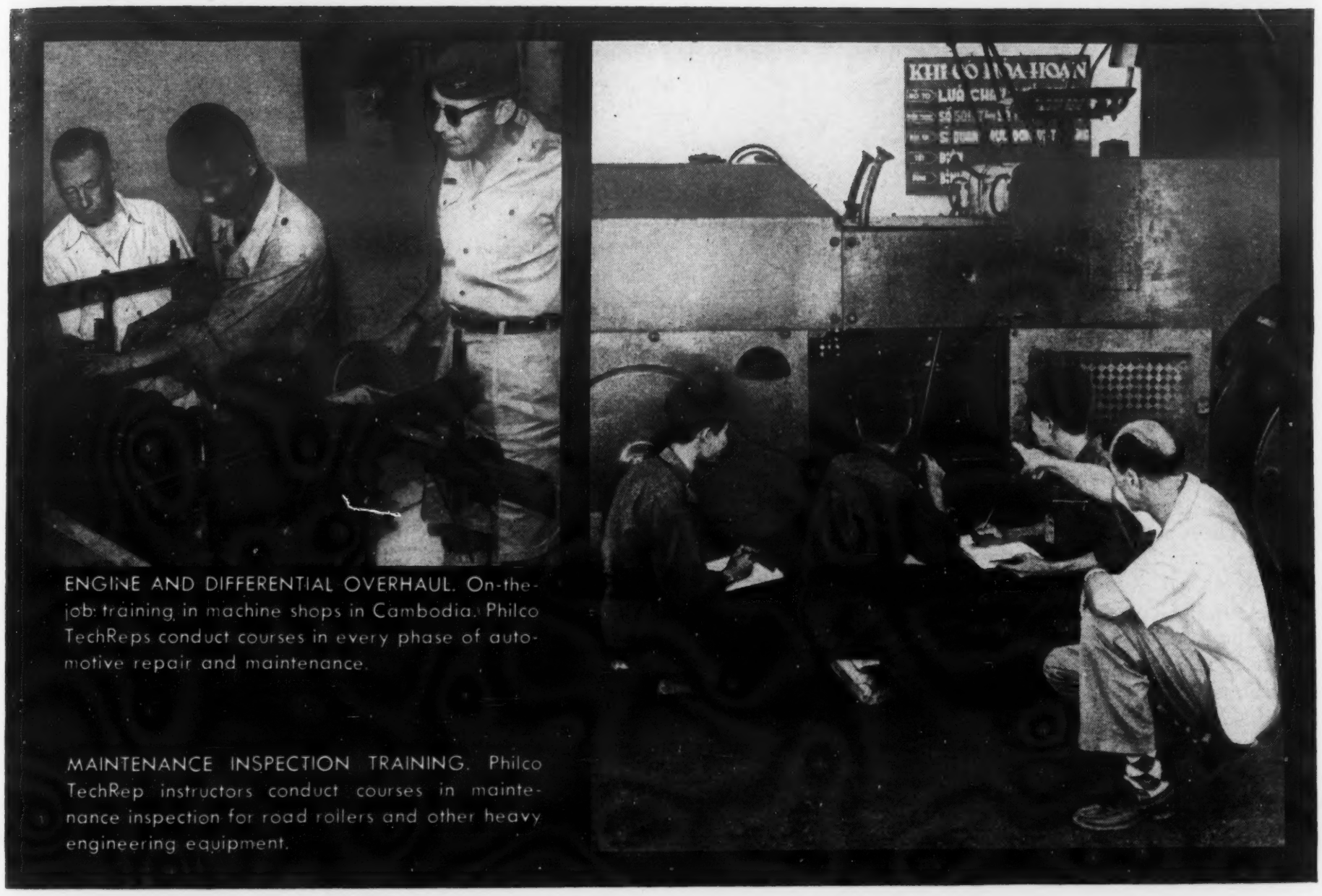
Framatic Development Company, Houston, Texas, specializes in the construction of dual purpose underground shelters for schools, home, industry, hospital and the military, under school yards, parking lots, etc.

According to the Framatic Company, shelter shielding is based on Atomic Energy Commission Project 32.2 and provides against blast, thermal radiation and fire storms. The shelters are constructed from a steel building material called "Framat." The company reports it can build reinforced concrete structures with the material without forms, thus providing construction economy. The steel Framats cost money, however, there is over-all saving in material, labor, money and time in the construction method, the Company believes.

For additional information, contact J. J. Ellis, Framatic Development Co., 601 Saddlewood, Houston 24.

• • •

The Electronics Division of the American Society for Quality Control is sponsoring a Product Maintainability Working Seminar to be held on October 24 and 25, 1961 at the Sheraton Hotel in Philadelphia. The program topics are as follows: Specifying Maintainability; Effects of Human Factors on Maintainability; Systems Level Trade Offs—Reliability vs. Maintainability vs. Availability; Choosing Degrees of Automaticity in Maintainability; Designing for Maintainability; Measurement and Demonstration of Maintainability; Predicting Maintenance Time; "Throw Away" Maintenance; Pric-



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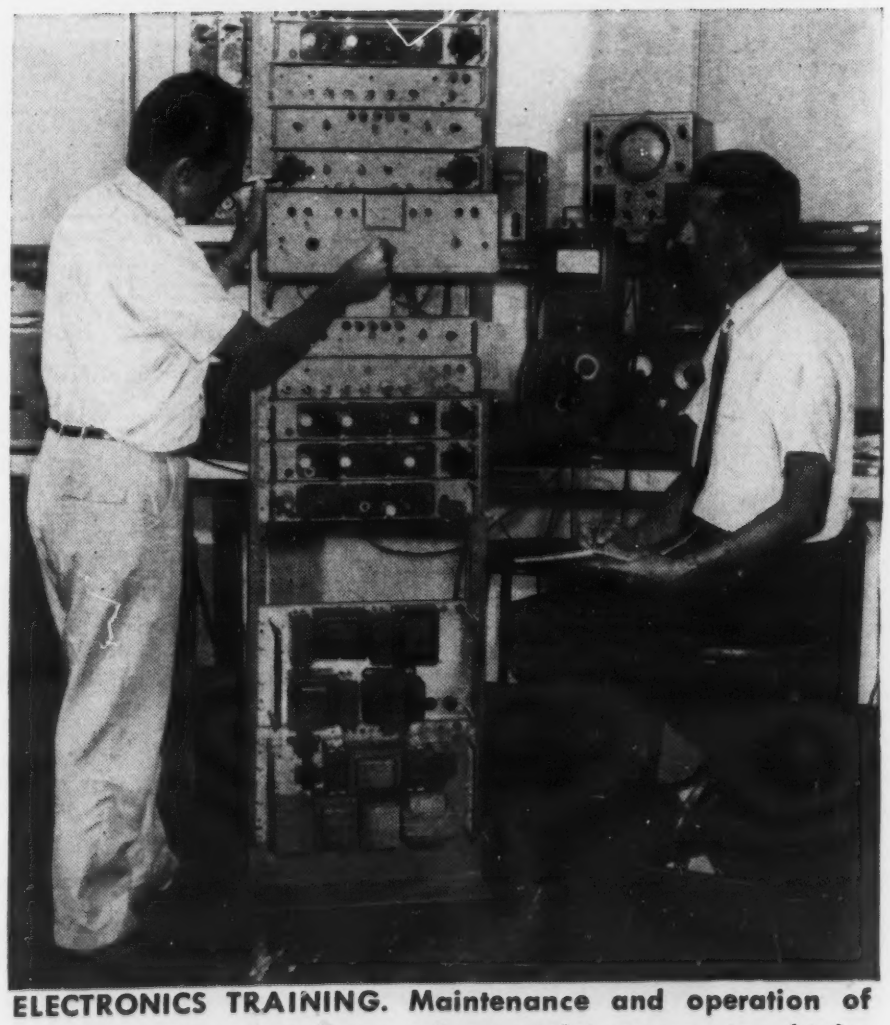

ELECTRONICS TRAINING. Maintenance and operation of equipments ranging from radar to teletype are taught by TechRep instructors on the job or in classrooms.

ing and Costing for Maintenance; and, Organization for Effective Maintenance.

The aim of the Seminar is to attain firm concepts in the above mentioned areas by promoting the exchange of ideas through the individual participation of attendees representing varied products and interest—both commercial and military. Registration will be limited. For additional information contact B. W. Marguglio, The Martin Co., Mail No. 2000, Baltimore 3, Maryland.

• • •

Amateur radio operators are to be congratulated for their excellent performance on Armed Forces Day, 1961. The operating skill, technical know-how and patience of the amateurs established new records in all phases of the communication activities. The total number of QSO's and competition entries far exceeded expectations. AIR, NSS and WAR contacted 4246 U. S. and foreign amateurs.

The colorful, one-time only QSL cards have been mailed to all contacts that could be identified in the "Callbook." Some cards have been returned as being unclaimed at the address listed. If you contacted either NSS, WAR or AIR on May 20, 1961 and have not received your QSL, write to the Armed Forces Day Contest, Room 5B960, the Pentagon, Washington, D. C., for a confirmation.

Certificates of Merit have been mailed to 736 contestants in recognition of making a perfect copy of the Secretary of Defense's International Morse Code message to radio operators. The message was transmitted at 25 wpm by military stations on May 20.

• • •

The Seventh Institute on Research and Development Administration will be held at The American University, Washington, D. C. from October 16-20. The Institute is designed to report and evaluate current thinking and methods for achieving maximum productivity from the basic research scientist.

Scientists and management personnel from government, business and industry are eligible to enroll in the Institute. The program has been arranged especially for those who are engaged in some phase of supervision or administration of basic research activities. To enroll or to request further information, write Dr. Lowell H. Hattery, Director, Seventh Institute on Research and Development Administration, The American University, 1901 F Street, N.W., Washington 6, D. C.

• • •

The Canadian Marconi Company has developed a Doppler Sensor described as an FM/CW device operating on the Janus principle, on a frequency of 8800 Mc/s with a nominal power of 500 milliwatts.

In this equipment the potential reduction in ground speed accuracy when flying over water is counteracted by switching in a ground speed calibrator shift. This operation is carried out simply by a movement of the terrain switch on the control panel to the sea position. For operation over smooth water the switch is further moved to the smooth position, which causes the equipment to operate in the so-called drift-mode. Under these conditions it reverts to a two beam system while a controlled pitch displacement is introduced into the antenna system so as to direct the beams downward at an angle which is more nearly vertical.

The equipment is designed to operate at heights between 50 and 50,000 feet with a drift not exceeding $\pm 40°$. The ground speed range is from 90 to 900 knots.

• • •

An air traffic control system developed by Avco Corporation's Electronics and Ordnance Division in Cincinnati for the Air Force, is currently undergoing tests at Atlantic City, N. J. Known officially as AN/GSN-11 or Air Traffic Control Central, the equipment is capable of directing 24 aircraft—18 in-bound and six outbound—at the same time.

The new system has undergone simulated testing at Cincinnati and is now being tested, using actual aircraft, at the Federal Aviation Agency's National Aviation Facilities Experimental Center. The tests are run jointly by the FAA and the USAF and will extend over several months.

• • •

Philco Corporation's 2000 Electronic Data Processing System as utilized in a space system for the Combat Operations Center, North American Air Defense Command, formally went into service July 1. The Space Detection and Tracking System, called SPADATS, is provided to NORAD's Commander-In-Chief, General Laurence S. Kuter, by the Air Force as part of its aerospace defense contribution. The Center will provide round-the-clock electronic cataloging of all man-made objects in space.

SPADATS is designed to detect,

track and identify man-made objects in space and to consolidate and display information regarding such objects. The system presently consists of U. S. Navy and U. S. Air Force operated sensors linked by a communications network to SPADATS.

SPADATS stems from an undertaking of 1957 when the Advanced Research Projects Agency directed the establishment of a space track function. The National Space Surveillance Control Center was established at L. G. Hanscom Field to catalog all artificial satellites launched. In November 1960, a realignment of the military space detection and tracking system was announced by the Department of Defense. SPASUR (Space Surveillance Detection Net), an east-west satellite detection fence developed by Navy for ARPA, to discover dark or non-radiating satellites functioning across the southern U. S. from Brown Field, San Diego to Ft. Stewart, Georgia, reported into SPACETRACK (National Space Surveillance Control Center). SPACETRACK was established by the Air Force for ARPA and received, analyzed and cataloged orbital data received from SPASUR and other sources.

Under the realignment, SPACETRACK and SPASUR report directly to the Commander-in-Chief, North American Air Defense Command, in Colorado Springs.

• • •

Hoffman Electronics Corporation, Semiconductor Division has developed a new solar cell which reportedly delivers 15 percent more power than present cells.

Developed with the aid of a solar simulator which duplicates the sunlight found beyond earth's atmosphere, the cells, called blue space cells, can deliver from 9.5 to 10 watts per square foot of solar cell panel surface.

• • •

General Electronic Laboratories, Inc., Cambridge, Mass., has designed a Conelrad Programmer to carry out the complete civil defense alert cycle automatically. Called the Rust Conelrad Programmer, the new unit can be activated by non-technical persons through a push button or remote control to provide the entire cycle required by the FCC.

Designed for continuous operation the Programmer uses no tubes or transistors. The equipment can be installed on any transmitter. The unit consists of a power supply, a synchronous-driven cam assembly, a vibrating reed audio-oscillator and

relays to perform the various functions of the Conelrad alert.

• • •

A system of building-block communications devices for high-speed simultaneous transmission of digital information from a variety of sources has been developed by ACF Electronics, a division of ACF Industries, Inc.

The system is called ABCD for *A*CF *B*uilding Block *C*ommunications *D*evices. The ABCD approach reportedly makes it possible for a military or industrial user to install only a single rack of interchangeable plug-in building blocks to adapt all types of existing data equipment for transmission of data over a standard telephone line. As many as 16 different machines may simultaneously feed their teletype, tape, punch card or other information into the equipment and have the complete mass of information transmitted at 4800 bits per second over a single channel to the receiving point where similar equipment unscrambles the information and feeds it back to teletype, tape, punch card or other machines.

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The Hallicrafters Company, Chicago, has developed a digital data transmission system for voice communication channels. CTDS 2400 transmits the equivalent of 32 teletypewriters over a single voice communication channel with a maximum error rate of 1 bit in 10^5 using ordinary wire telephone lines or UHF, VHF and microwave carrier systems.

CTDS 2400, consisting of a transmitter and receiver, converts binary pulses to an audio frequency signal which can be transmitted and demodulated in the receiver to yield the original signal with a maximum error possibility of one bit in a hundred thousand. The Hallicrafters system transmits at the rate of 2400 bits per second.

• • •

The National Co., Inc., Malden, Mass., has announced a new equipment which provides 2000 frequency channels for telemetry, radar, navigation and communications systems.

The NC-3800 Miniature Frequency Synthesizer is an ultraminiature disciplined incremental oscillator which provides up to 2000 frequency channels from 38-58 Mc. in 10 Kc. steps. An integral frequency standard provides frequency stability of 3 parts in 10^7 per month. Digital gating circuits facilitate instantaneous frequency selection and readout provisions.

A pneumatic digital computer is under development by Kearfott Division of General Precision, Inc.

The computer will be able to operate in temperatures from —100°F. to 2000°F. without special provisions for heating or cooling, the company reports, and in almost any radiation environment since it has no electronic or solid state components. The system uses a bistable element or flip-flop which operates on compressed air or other gas and has a switching time of ten millionths of a second. This element can be packaged at 6000/cubic inch, or about 3000/cubic inch with all interconnections. Thus, a medium size, general purpose pneumatic digital computer, complete with memory, will occupy a volume measuring about 5½x5½x1 inches.

• • •

A compact arming programmer-timer system which uses digital techniques has been designed by the Diamond Ordnance Fuze Laboratories, Ordnance Corps, Department of the Army. The package and its modules were designed by the Cleveland Metal Specialties Co., Cleveland, Ohio.

The system was displayed last June at the 5th National Convention on Military Electronics in Washington, D. C. Two units were displayed—one an actual working model, and one which was a spread out version built into an attache case so that its functions could be visualized and its components sections observed. The demonstration unit had a switch panel to simulate four different flight times, timing sequence lights, plus the electronic packages of the clock, timer, readout and switching sections. Power switching circuits have an aggregate power handling capacity of one-half horsepower. While the density of the working model in the can is 300,000 component parts per cubic foot, the unit is constructed of Micram modules with a density of 500,000 parts per cubic foot.

In actual missile operation, the programmer-timer, which is essentially a digital electronic clock computer, will operate precisely according to the pre-determined programming imparted to it before the missile launching.

• • •

An optically activated waveguide arc detector for use in the L band, 1.12 to 1.7 Gc, has been introduced by FXR, Inc., Woodside, N. Y.

The detector, Model S-61-1, is at present in use as a final amplifier protective device on high power radar systems. Photo diodes, used as the sensing elements, are mounted ex-

ternal to the waveguide and are light activated through optical prisms sealed directly in the waveguide. The prisms are oriented to monitor the windows of the final amplifiers. At the presence of an arc, the signal from the photo diodes is sent through an amplifier section for power to activate a ferrite waveguide switch or else to cut off the RF drive to final amplifier. Reaction time of this system from start of arc to cut-off of pulse is 5 to 10 microseconds max. System operational checks are provided by a test light source incorporated into the waveguide.

• • •

A molecularized computer, one-tenth the size and weight of a transistorized computer, is under development at the Westinghouse Electric Corporation's Air Arm Division.

The device, Mol-E-Com, will weigh less than 15 pounds and occupy less than one-third of a cubic foot instead of the 175 pounds and three cubic feet required by a similar conventional transistorized computer. Methods of measuring reliability in the field of molecular electronics are under study at Westinghouse.

• • •

An ultraminiature experimental transistor has been announced by the Radio Corporation of America. The transistor is made by depositing thin films by evaporation on an insulating base.

The thin-film transistors and the fabrication technique used in the laboratory were developed by Dr. Paul K. Weimer at RCA's David Sarnoff Research Center, Princeton, N. J., with assistance in various phases of the work from Dr. Frank Shallcross and Dr. Joseph Dresner.

The active material used in the transistor is cadmium sulfide. In making the transistors, an evaporation process is used to deposit successive thin layers of cadmium sulfide and metal on a glass plate, creating a device that is only a few ten-thousandths of an inch thick. In the evaporation process, the cadmium sulfide crystals and the metal are heated in successive steps in a vacuum, turning to vapor that is collected by condensation on the glass plate.

By using a special mask to cover portions of the plate during the process, the metal layers are deposited in a pattern that forms the electrical contacts needed to operate the transistor. The masking process also can be used to produce various patterns of connections among many transistors to complete a desired circuit at

the same time that the transistors themselves are being made.

Photoprogress

The Third International Festival of Television Films has awarded first prize to the California Institute of Technology Jet Propulsion Laboratory for its documentary film, *Project Echo*. Announcement of the award was made by a jury of ten members in Rome, Italy.

JPL's *Project Echo* film, a half-hour color film, tells the story of the successful launching of Echo on August 12, 1960. Irl E. Newlan, Manager of Technical Reports at JPL, produced and wrote the film and Norman F. White, Assistant Section Manager of Technical Reports, was the director. Peter Madsen was the associate director, and the photographic techniques were by George Emmerson, Manager of Photography Section and Robert Pace, Assistant Supervisor of the Photography Section. The film has been entered in the Milan Film Festival which takes place this month.

(Editor's Note: While SIGNAL does not have an official word from Mr. Irl Newlan, it is understood that a new movie is in the making. The movie is based on the sea and communications voyage in 1931 of the first *Nautilus* under the North polar ice cap. Working with Irl Newlan is our man of many adventures, Ray E. Meyers. Mr. Meyers, Region F Vice President, was a passenger and wireless operator on the first *Nautilus*. He is the author of *The Nautilus, There Were Two* which appeared in the October, 1958 issue of SIGNAL. For excitement, humor and enjoyment your Editor recommends the rereading of this article.)

• • •

The 90th Convention of the Society of Motion Picture and Television Engineers will take place October 2-6 at the Lake Placid Club, Essex County, New York. Theme of the Convention is *Integration of Motion Picture and Electronic Systems.*

Serving as Program Chairman is C. Loren Graham, photographer engineer with the Color Technology Department of Eastman Kodak Company.

• • •

Camera number one of the Tiros III weather observation satellite has been reported out of action since July 24 by NASA. Tiros III was launched July 12.

According to project officials, the

camera failure was detected by the Wallops Island, Virginia station, following the 170th orbit of the satellite. Cause and permanency of the malfunction have not been determined.

Prior to failure, the camera had taken 2020 photographs of the earth's cloud cover. Quality of the photographs was excellent.

Camera number two, a duplicate photographic system in the satellite has now been put into full time operation. The possibility of such a failure and the greater value of wide-angle photographs led to the duplicate wide-angle camera system, replacing the wide and narrow angle cameras used in Tiros 1 and II. Tiros I transmitted over 22,000 photographs and Tiros II is still transmitting on command after taking over 37,000 photographs. To date. Tiros III has transmitted over 3,500 cloud cover pictures.

The television cameras in Tiros III use a one-half inch Vidicon tube especially designed for satellite use. The cameras are aligned parallel to the satellite's spin axis and "see" through the spacecraft baseplate. The cameras consist of a Vidicon tube and a focal plane shutter which permits still pictures to be stored on the tube screen. An electron beam converts this stored picture into a television type electronic signal which can be transmitted to ground receivers. Connected to each camera is a magnetic tape recorder and electronic clock or timer. Out of ground station range, each camera can record up to thirty-two pictures on the storage tape for later relay—this can be done by programming the timer, as much as five hours in advance. When the satellite is within ground station range the photos are readout and the tape is wiped clean, immediately rewinding itself for its next recording. The magnetic tape storage system can also be bypassed, and the satellite then transmits pictures directly to the ground station as it passes through its range.

The plastic tape is 400 feet long and moves fifty inches per second during playback and recording. Photo data are transmitted from one camera at a time and tape readout from both cameras takes about three minutes.

• • •

A closed circuit television camera claimed to be the lowest priced internal television system in the world, is being produced in Britain by Nottingham Electronic Valve Co., Ltd., of East Bridgford, Nottinghamshire.

The camera, priced for the British home market at about 125 pounds ($350) without lenses, is designed to work into any standard domestic television receiver by means of a coaxial feeder running from the output socket of the camera to the aerial socket of the receiver. It weighs 12 pounds, measures 11½ x 5½ x 6¾ inches in a louvred steel case and is fitted with a standard external tripod bush. Normal transmission range is approximately 300 yards, but boosters can be supplied to extend the range to four or five miles. Electric power consumption is approximately 50 watts.

According to British Information Services, an agency of the British Government, the low material cost of the unit has been achieved by using a special circuit design together with modern transistors and semi-conductor devices.

The semiconductors consist of one transistor, four silicone diodes and two germanium diodes. Circuit features of interest are the vertical and horizontal generators. The vertical generator is the driven type. The horizontal generator is designed to be phase unstable, with the result that the line synchronization pulses have a run-through characteristic relative to the frame, giving results approximating to a fully interlaced picture.

The camera-tube focus current is tabilized and the circuit is arranged to give inherent scan failure protection. A fairly conventional video-amplifier is used in conjunction with a semiconductor modulator.

• • •

A request by the Society of Motion Picture and Television Engineers for the establishment of an American Standards Association Sectional Committee on Video Tape Recording has been accepted by a General Conference on Magnetic Visual-Aural Recording held by the ASA. SMPTE will serve as administrative sponsor of the committee to be composed of manufacturers, consumers and representatives of other interested groups. They will consider all proposed American Standards for magnetic tape recording.

Names in the News

Gerald L. Phillippe has been elected president of General Electric Co.

Cramer W. LaPierre has been elected executive vice president of General Electric Co.

Capt. Sam E. Edelstein, Jr., USN, has been named Director of the Armed Services Electro-Standards Agency (ASESA), by joint agreement of the three Military Departments.

David R. Hull has joined Boyden Associates, Inc. Mr. Hull is a national director of AFCEA.

Walter A. Kirsch has been named to the newly created position of assistant to the president of Elm Instrument Corp., Hempstead, N. Y. Mr. Kirsch is a director of the New York Chapter of AFCEA.

William F. Rueger has been named a vice president and general counsel of Sylvania Electric Products, Inc.

Maj. Gen. John A. Barclay has joined The Lionel Corp. as vice president for research and development.

C. Daniel May, Jr., has joined the Communications Systems Center of International Business Machine's Federal System Division, as head of the Tactical Communications Systems Department.

Albert Haselman, vice president and general manager of Prodelin, Inc., and **Robert Lewis**, vice president in charge of research and development for Prodelin, Inc., have been elected to the board of directors.

Chester W. Nimitz, Jr., has been elected vice president of Perkin-Elmer Corp. and general manager of its instrument division.

Thomas E. Drumm, Jr., has been appointed administrator of the Business and Defense Services Administration, U. S. Department of Commerce.

Ronald B. Hirsch has recently been named president of the newly formed RHG Electronics Laboratory, Inc.

Gail E. Boggs, director of research and development, has been elected a vice president of Page Communications Engineers, Inc. **Col. Kirk R. Buchak**, USA Sig.C., (Ret.) has joined Page.

Dr. Charles W. Walton has been appointed vice president for research of the Minnesota Mining & Manufacturing Co.

Maj. Gen. Donald P. Graul has assumed duties at Scott AFB as deputy commander of the newly activated Air Force Communications Service.

Dr. F. Joachim Weyl has been appointed deputy chief and chief scientist of the Office of Naval Research.

Thomas R. Kurtz, Jr., Deputy Director of Naval Communications for the Naval Security Group/Head of the Naval Security Group, and **George F. Pittard**, Assistant Director of Naval Communications for Naval Command Systems, Office of the Chief of Naval Operations, Navy Department, have been named to the rank of Rear Admiral.

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- SIGNAL gives its advertisers an opportunity to present facts about services, products and achievements to a specialized audience.
- The AFCEA Convention guarantees a top side audience to hear presentations of technical papers on the latest communications-electronics achievements, and to view an entire display of products and services in an atmosphere of a masterfully coordinated technical trade show.

High priority, graphic communication data covering the full spectrum of business messages — from full scale drawings to two letters at a time — are examined at a demonstration of Alden High Speed Facsimile.

Now!... Practical, High-Speed Facsimile for the High Priority Graphic Information of Government, Industry & Commerce

In facsimile — the key to cost is utilization of transmission lines and equipment. So far, the biggest expense has been line cost. The greatest bar to full utilization of systems has been lack of flexibility in equipment.

Line costs are now plummeting — through the great increase in private "voice" networks, the recent availability of private microwave channels, and the filing of tariffs by A. T. & T. Company of low cost, broad channel communication links in their "Telpak" offering.

Alden facsimile equipment has the proven flexibility . . .

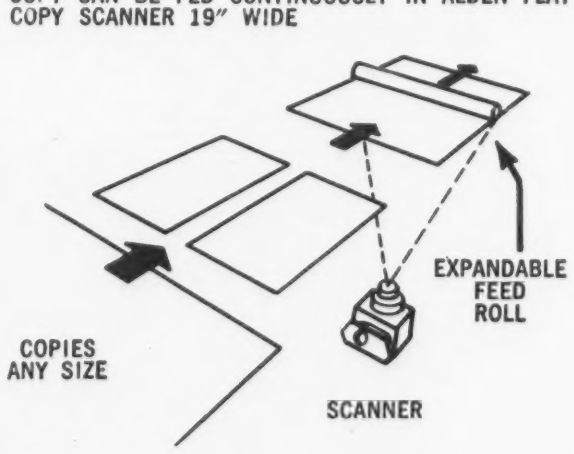
to take documentary copy of any size and shape, to operate on any channel (microwave, "voice" channel, broad channel), to operate at any speed (from 8 min. letter to 2 letters/min. or at any higher speed) with proven, practical designs . . . (standard equipment for the U. S. Weather Bureau on 2 national and territorial networks).

Alden equipment handles the entire spectrum of high priority graphic information.

Not restricted to letter size copy, Alden Flat Copy Scanners readily accept originals of any length, width or thickness. They have the flexibility to transmit everything from full scale layouts and plan drawings to 2 letters at a time or small size messages whether shingled or in parallel. Messages can be fed continuously or selectively scanned for greatest flexibility. The tremendous variety of messages that can be sent results in *highest utilization of equipment* for all high priority graphic information.

Alden equipment can load match the traffic of any system.

Not only the entire spectrum of size, length and thickness of copy can be



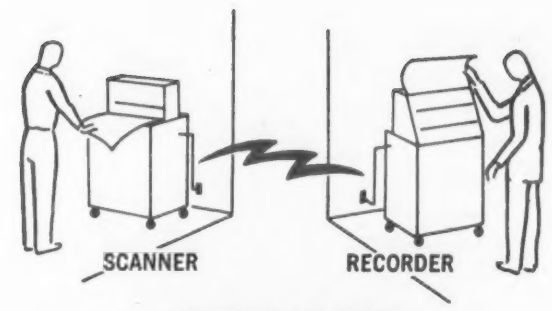
handled — but the most practical speed for the load can be chosen from standard Alden equipment to get the *highest utilization* of the communication link or channel selected. Alden equipment is not fixed at high or low speed. Through the use of modern tape equipment the ability to store at one speed and transmit at another gives *complete flexibility* to any systems layout — insuring highest utilization.

Alden equipment is designed as self-contained, modular units . . .

with low maintenance and running costs. Scanners can be placed wherever information is developed — fed into the facsimile communication system or network — and recorder placed wherever information needs to be utilized.

The ability to get highest utilization —

from Alden equipment does not come about by accident, but is made possible by the techniques Alden has pioneered.



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Alfax Paper and Alden Recording Techniques

From 1930 on, Alden has continuously engaged in facsimile development and application. Most significant was the development of **Alfax** "A" Recording Papers — the first and only stable and high speed electro-sensitive recording paper, which combined with Alden "adjusterless" Recording Techniques and simplified Flat Copy Scanning — form the basis for the important breakthrough in practical facsimile equipment and systems.

In 1946 ALDEN ELECTRONICS was set up as a manufacturer's manufacturer to supply systems, equipment, component recorders, scanners and their elements to users, OEM, and R&D groups in facsimile and instant graphic recording fields. This company can serve as the key to exploiting the new horizons opened by Alfax "A" Paper and Alden Recording and Scanning techniques and to benefit from the electronic packaging and manufacturing techniques of the original Alden Products Company

TODAY — Alden Electronics' equipment is standard throughout two national U. S. Weather Bureau facsimile networks. Backed up by over 200 service centers throughout the nation. Alfax Paper and Alden Recorders are also superimposing a whole new strata of instant graphic "quick see" recording devices in every scientific field from Oceanography to Radio Astronomy.

It is the fastest growing company in the facsimile field and is being joined by outstanding leaders who find that Alden recording techniques and Alfax "A" papers can expand and develop their markets.

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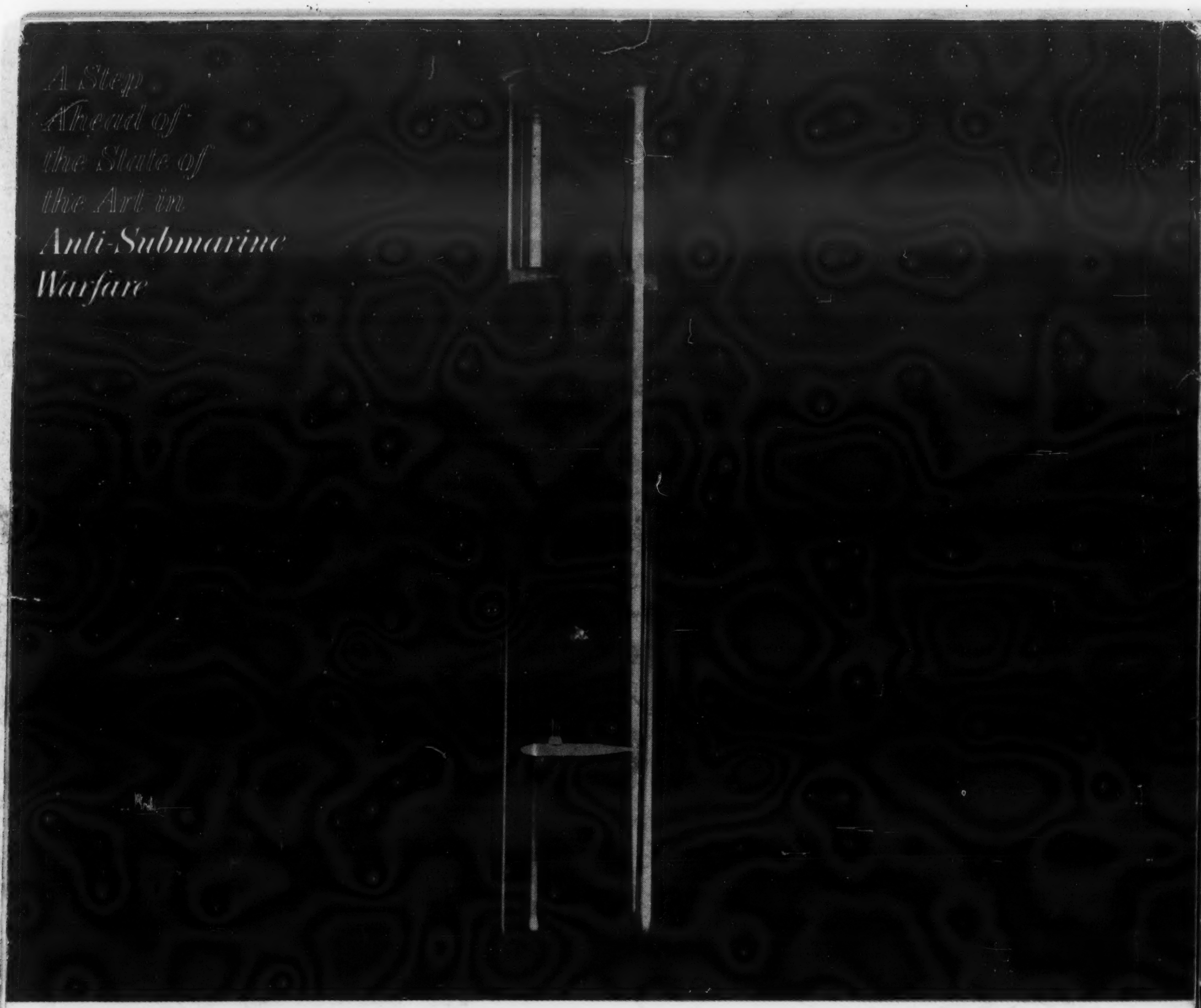

400,000-gallon test tube for ASW research

ASW research at General Dynamics/Electronics gets a powerful lift from a giant research tool . . . the largest privately-owned indoor facility for underwater acoustic testing. It's a circular, open-topped test tank, 48 feet across, 30 feet deep, complete with automatic test instrumentation for all types of acoustic measurements.

Overhead equipment, capable of hefting a 2½-ton transducer, can position a target or a transducer anywhere in the tank. Measuring equipment can be placed on the surface, to study the air-water interface as part of an acoustic transmission path. Underwater lights and a viewing port at the fifteen-foot level permit direct observation or photography.

Designed for great flexibility, the tank is the finest ASW research tool in the industry. It provides General Dynamics/Electronics with a commanding capability in the exhaustive testing procedures needed to develop and test advanced Sonar equipment.

Overall, General Dynamics/Electronics has a wide range of experience in the development and production of ASW equipment. Included in this background are the AN/SSQ-38 (XN-2) sonobuoy now under development, the AN/ARR-52 transistorized, high-density sonobuoy receiver now scheduled for production, and the AN/UQS-1D mine-hunting sonar, on which deliveries are now being completed.

For further information about ASW research and development at General Dynamics/Electronics, write: Military Products Division, 1400 North Goodman Street, Rochester 1, New York.

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